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THEORISING ICT EDUCATION AND ICT POLICY IN GREEN ICT: INSIGHTS FROM THE BELIEF ACTION OUTCOME MODEL AND ACCOUNTABILITY THEORY

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By

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SIGNATURE PAGE

THEORISING ICT EDUCATION AND ICT POLICY IN GREEN ICT: INSIGHTS FROM THE BELIEF ACTION OUTCOME MODEL AND ACCOUNTABILITY THEORY

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ABSTRACT

The study presents a comprehensive model that combines the investigative power of belief action outcome model and accountability theory and also integrates ICT education and ICT policy to examine factors influencing the Green IT Practice. The main purpose of this study was to investigate the effect of ICT education and ICT policies on Green ICT practice in Uganda. Adapting the Belief Action Outcome model, the study looked at the effect of societal structure and organisational structure on beliefs about the environment. These effects were moderated by Accountability theory constructs namely; identifiability, expectation of evaluation and awareness of monitoring.

The study adopted a post-positivist paradigm with a quantitative analytical survey research methodology. Using a deductive approach, questionnaires were used as the data collection tool. A cross-sectional study was conducted out and 384 respondents were selected using two stage cluster sampling. A response rate of 94% was achieved. Correlation and regression analysis, Medgraphs and Modgraphs were carried out. A Structural equation modeling was also estimated to test for mediation and moderation of the study variables.

It was found that societal structure, ICT education and organisational structure have a positive effect on beliefs about the environment. Societal structure, ICT education, ICT policy and organisational structure have a positive effect on Green ICT practice; Beliefs about the environment positively mediate the relationship between societal structure, ICT education, organisational structure and Green ICT practice. However, ICT policy was found to have a negative effect on beliefs about the environment. Expectation of evaluation was found to have a positive effect on Green ICT practice, while identifiability and awareness of monitoring didn't have a significant effect on Green ICT practice.

The study recommends accreditation bodies and academics to incorporate sustainability in ICT education in order to build knowledge and awareness of how ICT can be used to

conserve and manage the environment. It also recommends an increase in societal/community Green ICT initiatives since they have the greatest effect on Green ICT and consequently the environment.

Keywords: Societal structure, ICT education, ICT policy, organisational structure, beliefs about the environment, identifiability, evaluation, monitoring, Green ICT practice.

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DEDICATION

To the most loving parents; Canon Captain Roderick Y. Mlay and Mrs. Connie K. Mlay. The day I defended my Masters dissertation, you both asked when I will embark on the PhD. Thank you for always spurring me on to greater heights. You are the wind beneath my wings.

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ACRONYMS AND ABBREVIATIONS

AMOS – Analysis of Moments of Structures

ANOVA – Analysis of Variance

AVE – Average Variance Extracted

BAO – Belief Action Outcome model

BENVT – Beliefs about the Environment

CB- SEM – Covariance based Structural Equation Model

CFA – Confirmatory Factor Analysis

CFI – Comparative fit index

CI – Cultural Influence

CMIN/χ^2 – Chi-square

CPU – Central Processing Unit

CR – Composite Reliability

DF – Degree of freedom

EFA – Exploratory Factor Analysis

EVV – Evaluation

GeSI – Global e-Sustainability Initiative

GFI – Goodness of Fit index

GHG – Green House Gas

GICTP – Green Information and Communication Technology Practice

ICT – Information and Communication Technology

ICT4D – Information and Communication Technology for Development

ICTE/ ICTEDN – Information and Communication Technology Education

ICTP/ICTPL – Information and Communication Technology Policies

I-CVI – Item content validity index

IDD – Identifiability

IFI – Incremental fit index

IPMA – International Project Management Association

IS – Information Systems

IT – Information Technology

ITACQ – Information Technology Acquisition

ITDIS – Information Technology Disposal

ITSM – Information Technology Service Management

ITU – Information Technology Use

KMO – Kaiser-Meyer-Olkin

Medgraph – Mediation graph

MMM – Monitoring

Modgraph – Moderation graph

MW – Megawatts

NCHE – Uganda has the National Council for Higher Education

NFI – Normed fit index

NIL – Nano Imprint Lithography

NP – Normative Pattern

OECD – Economic Cooperation and Development

OLED – Organic Light Emitting Diode

OS/ ORST – Organisational Structure

P – Significance

PRISMA – Preferred Reporting Items for Systematic Reviews and Meta-Analyses

PCA – Principle Component Analysis

P-P plot – Probability-Probability Plot

Q-Q plot – Quantile-Quantile plot

R – Correlation Coefficient

R^2 – Coefficient of determination

RFI – Relative fit indices

RMSEA – Root Mean Square Error of Approximation

S-CVI – Scale content validity index

S-CVI/Ave – Scale Content Validity Index average

SE – Standard Error

SEM – Structural Equation Model

SID – Sustainable Interaction Design

SPSS – Statistical Package for Social Scientists

SS/ SSture – Societal Structure

SSA – Sub-Saharan Africa

TFI – Tucker Lewis Index

UNEP – United Nations Environmental Program

VIF – Variance inflation factor

WCED – World Commission on Environment and Development

WWF – World Wide Fund

ZPRED – Standardized Predicted values

ZRESID – Standardized Residuals or errors

Z-Score – Standard Score

β – Beta

χ^2/df – Relative (normed) chi-square

CHAPTER ONE

INTRODUCTION

1.1 Introduction

Information Communication Technology (ICT) has been fronted in many developing countries as a vehicle to middle income status, specifically by enabling advancement to a knowledge economy. The effects of ICT are however, two fold; both positive and negative. Whether these countries are deliberately planning for the negative effects of ICT is difficult to determine.

Sustainability is arguably one of the most pressing issues in today's world (Ali & Bailur, 2007; Al-Khouri, 2013; Elkington, 1999; Lee Park & Trimi, 2013; Patrignani & Whitehouse, 2014; Silvius, Brink & Smit, 2009; Umair, Björklund & Petersen, 2015). Most project managers focus on completing projects without giving any importance to their impact on the near future. Mary McKinlay; the Vice President of the International Project Management Association (IPMA) at the 22nd World Congress of the IPMA held in 2008 pointed out that it is time for project managers to not just "do things right" but "do the right things right" (Silvius et al., 2009, p.33).

The World Commission on Environment and Development (WCED) defines sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Ali & Bailur, 2007; Silvius, et al., 2009). There are mainly five types of sustainability: financial, social, institutional, technological, and environmental (Ali and Bailur, 2007; Delgadillo, Gómez and Stoll, 2002; Haris, Kumar, and Balaji, 2003; Kumar, 2005; Proenza, 2001) that need to be considered with ICT. However, by far, environmental sustainability has been given more primacy over the others (Newport, Chesnes and Lindner, 2003) because it spurs economic and social sustainability. The Organisation for Economic Cooperation and Development (OECD) stresses the inclusion of "green" aspects of sustainability (OECD, 1990). The call for environmental sustainability has however, often come after crises (Ali

& Bailur, 2007). Very few countries such as Australia have in effect developed environmental sustainability plans (Australian Government ICT Sustainability Plan 2010-2015, 2010) while most countries do not have a definitive plan for sustainability. The countries that have come up with policies to address the issue of sustainability have been challenged due to the need for economic growth (Al-Khouri, 2013). This has led many countries to focus more on the economic sustainability rather than environmental sustainability.

Countries in Tropical Africa have realised the importance of ICT and have included it in their plans for national development. According to Gillwald and Stork (2008) many developing countries especially in Africa have attributed ICT as a driver of economic growth and development. Among them are Uganda which on April 18, 2013 launched the Vision 2040 with the vision statement; A transformed Ugandan society from a peasant to a modern and prosperous country within 30 years (Karugaba & Mugabe, 2013; National Planning Authority, 2013). The Government of Uganda intends to fulfil this vision by developing core infrastructure including a high-tech ICT City and associated infrastructure and a Science and Technology park in each regional city to help exploit various opportunities (Karugaba & Mugabe, 2013; National ICT Policy, 2003; National Planning Authority, 2013).

Rwanda developed the Vision 2020 to transform Rwanda from an Agro-based to a knowledge-based economy by the year 2020 (Rwanda Vision 2020). Rwanda has also put much emphasis on ICT as the main vehicle to deliver the country to her vision with projects such as the community telecentres, Kigali ICT Park, ICT buses (Odoobo, 2009), one laptop per child project, OpenMRS, TRACNet (NICI-2010 Plan, 2005), among others. Tanzania's Vision 2025 which is aimed at transforming the economy to a middle income country is also advancing ICT as a major driving force to social and economic transformation (Planning Commission, 2005; Zaipuna, 2005). Kenya's Vision 2030 aims to transform Kenya into an industrialised economy with the vision statement, Middle-income country providing a high quality life to all its citizens by the year 2030 (Kenya

Vision 2030, 2007). The government of Kenya is looking at ICT as a key driver to this and has established a major Business Process Outsourcing (BPO) park (Kenya Vision 2030, 2007) and the "African Silicon Savannah" – the Konza Techno City (BBC News Africa, 2013). It is not easy to determine whether economies merely want to exist in the information society (Castells, 2001; Heeks, 2002), or have a precise plan to ensure it has a mostly positive impact.

Information and Communication Technology for Development (ICT4D) has taken centre-stage in Uganda. In 2011, the Ministry of Education and Sports of Uganda passed a directive to all secondary (high) schools to teach either mathematics or ICT as compulsory subjects to all students in the Advanced Level. By March 2012, about 67% of the mostly Government aided schools surveyed had acquired computers for the purpose of teaching students however, at a student to computer ratio of 15:1 (Talemwa, 2012). These have mainly been supplied by the Uganda Communications Commission. This, together with other government and private sector endeavours to computerise, there is only scanty mention of ICT and the environment in the National ICT Policy for Uganda (Ministry of Information and Communications Technology, 2012). This leaves a lot to be desired in light of the accelerating environmental degradation.

Some Universities around the world such as the University of Florida (Biedenweg et al., 2013) and TERI University (Jain, Aggarwal & Sharma, N.P., 2013) have introduced courses on sustainability and ethics of sustainability to provide a backbone for sustainability. The studies found most of the students who were taught sustainability intended to implement sustainability concepts professionally or personally. However, many universities have not incorporated sustainability in their programs; therefore, its importance has not been highlighted to the students who eventually manage these ICT initiatives. ICT is pervasive and has been incorporated in almost all areas and therefore, introducing sustainability in ICT education will go a long way in having sustainability incorporated in all other areas.

According to Casal et al. (2005, p.78), Erdmann (2008), Forge (2007, p.4), Hilty, Arnfalk, Erdmann, Goodman, Lehmann & Wäger (2006), Rivera, Håkansson, Svenfelt & Finnveden (2014) and Silvius et al., (2009) the effects of ICT on the environment have been broadly categorised in three ways. The first order effects; the impacts and opportunities created by the physical existence of ICTs and the processes involved that increases the consumption of energy, emission of greenhouse gas and non-recycled solid waste. This impact is majorly negative on the environment. The second order effects; the impacts and opportunities created by the ongoing use and application of ICTs. The effects here are generated by virtual goods, virtual stores, tele-working, tele-meetings, tele-collaboration, etc which mostly present a positive impact on the environment by reducing emissions from movement. The third order effects; the impacts and opportunities created by the aggregated effects of large numbers of people using ICTs over the medium to long term. These include impacts on facilities managed, on supply chains, on total freight transport and on total passenger transport.

Berhout and Hertin (2001) point out that the impact of ICT on the environment has been ignored because it is considered to lack parity with the benefits they present. On the positive side, ICT enables reduction in energy consumption hence preserving the environment (Berhout & Hertin, 2001). Others include use of ICT for electronic monitoring of toxic emissions, remote sensing among others (Berhout & Hertine, 2001). On the negative side, ICT increases a risk on the environment stemming from the production, use and disposal of hardware (Berhout & Hertin, 2001). Many researchers of ICT have neglected the issue of environmental sustainability (Ali & Bailur, 2007; Gholami, Watson, Hasan, Molla & Bjørn-Andersen, 2016; Watson, Boudreau & Chen, 2010). This requires that ICT education is modified to include environmental sustainability as a responsibility of the ICT implementers and users. The ICT policies that guide implementation and usage of these ICTs should also be revisited and disseminated to cater for environmental sustainability. This will consequently help avert these nations from plummeting into ICT4D without planning for environmental sustainability. Green ICT can be used as a means of conserving our environment. Mishra, Yazici & Mishra

(2012) define it as information technology and systems initiatives and programs aimed at addressing environmental sustainability. Murugesan (2008) explains that Green IT focuses on reducing the negative impact of IT on the environment through the proper acquisition, use and disposal of IT and related products in ways that are friendly to the environment. Molla et al. (2011) further state that to be able to achieve Green IT, it is necessary to embed environmental considerations in the IT infrastructure, IT human resource and IT management. This study therefore, investigated Green ICT practice in Uganda; focusing on the impact of ICT education and ICT policies on Green ICT practice. The theoretical gap that this study filled is discussed below.

1.2 Theoretical gap

Research on Green ICT has been conducted by many researchers (Ali & Bailur, 2007; Berkhout & Hertin, 2001; Delgadillo et al., 2002; Gholami et al., 2016; Harris, Kumar, and Balaji, 2003; Kumar, 2005; Proenza, 2001; Munda, 2006; Pezzey & Toman, 2002; Remigijus, Ramanauskiene and Martinkus**,** 2009; Watson et al., 2010). This clearly shows it is an urgent and pressing issue (Markovic et al., 2012; Watson et al., 2010; Zhang & Liang, 2012). Some of the studies in Green ICT mention the role of Information Technology (IT) staff and users in promoting environmental sustainability but do not place emphasis on the role of education and ICT policies to shape them. Some Universities have adopted teaching of sustainability and ethics of sustainability (Biedenweg et al., 2013; Dade & Hassenzahl, 2013; Jain et al., 2013; Stubbs and Schapper, 2011), but not much focus has been placed on their teaching in the context of information technology. However, these studies have mostly had a focus on countries with a different economic, social, institutional, technological, and environmental situation from Uganda. Silvius et al. (2009, p. 43) concluded that "it can be expected that implementing the concept of sustainability in projects will require different skills than those that are the 'bread and butter' of most project managers today". However, not many studies have been conducted on these different skills needed in order to improve sustainability. The Information System (IS) academic community is lagging behind in

contributing towards research in Green ICT (Gholami et al., 2016; Lee, Park & Trimi, 2013; Watson et al., 2010).

Some studies have adopted the Belief Action Outcome (BAO) model on environmental sustainability studies; a model designed for environmental studies (Dedrick, 2010; Melville, 2010; Molla, Cooper, & Pittayachawan, 2011; Seidel, Recker & Von Broch, 2013). The model looks at societal structure and organisational structure and their effects on beliefs about the environment and subsequent sustainability actions. However, an individual's intention to engage in a particular action is further influenced by their perceived accountability to those around them (Lerner & Tetlock, 1999). Therefore, only the societal and organisational structures that contribute in shaping a person's beliefs about the environment may not spur one to actually engage in sustainability actions for Green ICT. The theoretical gap that this research explored was the incompleteness of the stand-alone theories that have been used in Green ICT studies by triangulating the Belief Action Outcome model with the Accountability theory. Furthermore, the influence of ICT education and ICT policies on Green ICT in Uganda was investigated.

1.3 Motivation of the study

Uganda has embraced ICT as a vehicle for development as demonstrated in initiatives such as the planned high-tech ICT City and associated infrastructure and a Science and Technology park in each regional city (Karugaba & Mugabe, 2013; National ICT Policy, 2003; National Planning Authority, 2013). To prepare for this, the Government of Uganda through the Ministry of Education and Sports made a decision to teach computer studies from high school level. However, the question that remains baffling is whether there is a deliberate plan for environmental sustainability through Green ICT in Uganda. Computing devices; both new and used have been purchased and/or donated and brought into the country to ease access to computing services and teaching of ICT skills. However, with the influx of these computing devices, there has not been a clear Life Cycle Analysis to ensure environmental sustainability, regarding the three stages of purchase, use and decommissioning of the devices. To make matters worse, it is difficult

to establish who should take this responsibility. As posited by Ali and Bailur (2007) the call for sustainability has often come after crises. Mary McKinlay at the 22nd World Congress of the IPMA held in 2008 said the onus of ensuring environmental sustainability should be on project managers (Silvius et al., 2009). However, most ICT project managers in Uganda have had little or no exposure to environmental sustainability issues and practice. This has been ongoing for a long time and yet its effects are far-reaching. A Kenyan proverb states that, "We do not inherit the earth from our parents; we borrow it from our children" (Pezzoli, 1997). It is important to preserve the environment for the future generation. Therefore, this research investigated Green ICT practice in Uganda. It explored factors that play a role in shaping Green ICT practice, specifically the role of ICT education and ICT policies.

1.4 Purpose of the study

The main purpose of the study was to investigate the effect of ICT education and ICT policies on Green ICT practice in Uganda. Adapting the Belief Action Outcome model, the study further looked at the effect of societal structure and organisational structure on beliefs about the environment. These effects were moderated by some constructs of the Accountability theory; identifiability, expectation of evaluation and awareness of monitoring. This study was therefore, guided by the following specific objectives;

1. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on beliefs about the environment in Uganda.
2. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on Green ICT practice in Uganda.
3. To examine the mediating effect of beliefs about the environment on the relationship between societal structure, ICT education, ICT policies, organisational structure and Green ICT practice in Uganda.
4. To establish the effect of beliefs about the environment on Green ICT practice in Uganda.

5. To assess the moderating effect of identifiability, expectation of evaluation and awareness of monitoring on the relationship between beliefs about the environment and Green ICT practice in Uganda.

In order to achieve the purpose of the study, the following overarching research question was posed; how do societal structure, ICT education, ICT policies and organisational structure affect Green ICT practice in Uganda?

1.5 Subject Scope of the study

The subject matter was limited to investigating how ICT education, ICT policies, societal structure and organisational structure shape beliefs about the environment that influence Green ICT in Uganda.

1.6 Justification of the study

Uganda currently has a number of ICT4D projects with so many ICT projects being rolled out to help deliver the economy to a middle-income economy. The issue of environmental sustainability in light of these ICT projects which has been ignored poses an urgent problem that needs to be brought to light and discussed in order to provide a solution. A review of literature was also not able to establish related articles on Green ICT in Uganda; this study found only 4 articles on Green ICT in Africa that focused on Nigeria and Kenya. The purpose of this study was to provide a conceptual solution to this eminent problem of environmental sustainability by putting across ICT education and ICT policies that are in support of good environmental practices.

1.7 Significance and impact of the study

The study will be essential to ICT managers by informing them the necessity of incorporating sustainability as part of their mandate when implementing ICT projects.

Similarly, the issue of sustainability is not only contained in ICT projects, therefore, other project managers will also use the outcome of this study to inform their decisions.

The study will be important to organisations that intend to implement ICTs in their operations by highlighting the plight of not having an environmental sustainability plan. The outcome of this study will help these organisations tackle the issue of sustainability from a more informed background and also devise means of ensuring someone champions it in their ICT projects.

The study will be important to policy makers when making ICT decisions that impact their nations. A lot of decisions in SSA are made not based on researched information. The findings and outcome of this study will help bridge this gap by availing empirical evidence on Green ICT in Uganda.

The study will also be important to universities and policy makers in the area of higher education to make informed decisions on sustainability by incorporating sustainability of Green ICT in ICT education in order to produce graduates and IT managers with the right knowledge and skills to implement ICT in ways that will not affect the environment negatively.

This study will also append to the pool of knowledge on Green ICT. Other scholars and researchers will be in position to refer to the contents of the study for any future related studies and debate.

1.8 Limitations of the study

The study was limited to data collected from only one country using cross-sectional design even though one's participation in Green ICT is mostly a behavioural issue that would merit more from a longitudinal study. Further, the post-positivist approach adopted

does not adequately cater for all the respondents' perspectives. The use of pre-coded questionnaires further curtailed the respondents' perspectives.

CHAPTER TWO

SYSTEMATIC LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1 Introduction

The concept of sustainability has been defined in numerous perspectives by different scholars (Ali & Bailur, 2007; Lopes, 2012; Pezzey & Toman, 2002; Remigijus, et al. 2009, Silvius et al., 2009). One perspective views sustainability in terms of being able to increase the standards of living of the underdeveloped people (Silvius et al., 2009). Silvius et al. (2009) posits that sustainability entails increasing the material standards of living of the poor measured in terms of increase in food, educational service, healthcare, water, real income, among others. On the other hand, Al-Khouri (2013, p. 202) simply put it as "the capacity to endure". This means for something to be considered to be sustainable, it should be available or functional over an extended period of time. Another definition is hinged on the concept of "green" aspects that emphasise on the link between the economy and conservation of the environmental resources (Silvius et al., 2009; WCED, 1987). The Organisation for Economic Cooperation and Development (OECD) in 1990 (Silvius et al., 2009) added that when talking about sustainability one should make the connection between economic activity and environmental conservation. According to the OECD "It implies a partnership between the environment and the economy". This has also been supported by the International Institute for Sustainable Development (Silvius et al., 2009) that elaborates the need to meet today's organisational needs while guarding, sustaining, and improving the human and natural resources for the future. These diverse definitions show that the concept of sustainability is cross cutting with different stakeholders expecting it to cover different dimensions according to their respective sectors. This implies that sustainability is looked at differently according to the sector i.e. agriculture, governments, ICT, manufacturing among others. This study focuses on environmental sustainability.

Many studies have been conducted in the purview of Green IT but mostly focusing on positive and negative impacts of IT on the environment. The purpose of this section is therefore, to assess the influence of ICT education and ICT policies on Green IT adoption in Uganda. Employing a systematic literature review approach, the section highlights the characteristics of articles written about the topic and highlights the gaps that need to be filled. The section will first present a brief overview of environmental sustainability, effects of ICT on the environment, the concept of Green IT, the state of Green IT and education and the state of Green IT and policies in both developing and developed economies. This will be followed by a detailed description of the adopted methodology for the systematic literature search, screening, quality appraisal and data extraction. The subsequent sub section presents results through a classification and narrative synthesis due to the heterogeneity of the included studies (Zeh, Sandhu, Cannaby & Sturt, 2014).

2.2 Systematic Literature Review Methods

2.2.1 Review Purpose

The main purpose of this literature review was to investigate the influence of ICT education and ICT policies on Green ICT awareness and practice. This review was guided by the following research questions; 1. How does ICT education influence Green ICT? 2. How do the current ICT policies influence Green ICT? We therefore, reviewed literature on Green ICT and the role of ICT education and ICT policies in different parts of the world to answer these questions. A quantitative content analysis, classification and presentation of the results were adopted for this study. This was guided by a search protocol to ensure consistency during the review. The protocol detailed the search criteria, filters and exclusion criteria.

2.2.2 Eligibility

This systematic review included journal articles of qualitative, quantitative and mixed methods studies. Eligible studies included both primary and secondary research on higher ICT education, ICT policies, Green ICT and environmental sustainability. Publication

date was restricted to papers published from 2006 to date. This was in order to map out Green ICT practices in the last 10 years. Only articles written in English were used in the study due to language limitations of the researcher.

2.2.3 Search strategy

The search strategy included all studies on Green ICT, environmental sustainability, Green ICT education and ICT policies. Only academic peer reviewed journal articles were used in the study; conference papers, books and special papers were excluded from the search. The following libraries offered journals to download; EBSCOHOST and Elsevier. The following databases were searched; Emerald Management Thinking, Emerald Fulltext and Management Reviews, Google scholar, Science Direct, Academic Search Complete, Computer Source, Educational Administration Abstracts, Environment Index, GreenFile, Information Science & Technology Abstracts, Science & Technology Collection and E-journals. These databases were selected because they publish journals with well authenticated articles on Green ICT and environmental sustainability. Due to the initial difficulty in finding papers that had all the keywords, the search was done in two phases. The first phase searched for papers on Green ICT and Education and the second phase on papers on Green ICT and policy.

2.2.4 Selection criteria

Abstracts of the papers downloaded were extracted and screened for eligibility by three reviewers. Reviewer I (SVM) reviewed all the 92 (100%) abstracts while Reviewer II (HMS) reviewed 40 (43%) and Reviewer III (GKM) reviewed 52 (57%) of the abstracts. Disagreements were resolved through discussion and consensus by the three reviewers. Cohen's kappa to test for inter-coder reliability of the screening process was computed to test for agreement level. According to Landis and Koch (1977), results of 0.81 and above represent an almost perfect agreement, 0.61-0.80 represent substantial agreement, 0.41-0.6 represent Moderate agreement, 0.21-0.4 present fair agreement, 0.01-0.2 represent slight agreement while anything below that is less than a chance agreement. Cohen

(1960) vouches 0.85 and above as a very high level agreement. Our Cohen's kappa was 0.91; showing an almost perfect agreement.

2.2.5 Data extraction and quality assessment of the literature

We built a spreadsheet with 5 sub areas to extract data relevant for our study. These sub areas are designed to answer our research questions. They were divided into country of study, area of study (Green ICT only, Green ICT and Education and Green ICT and Policy), Year of publication, study type (Awareness, Reflection, Adoption, Impact analysis, Strategy) and research design. These areas were carefully extracted by the primary reviewer after reading the selected papers thoroughly.

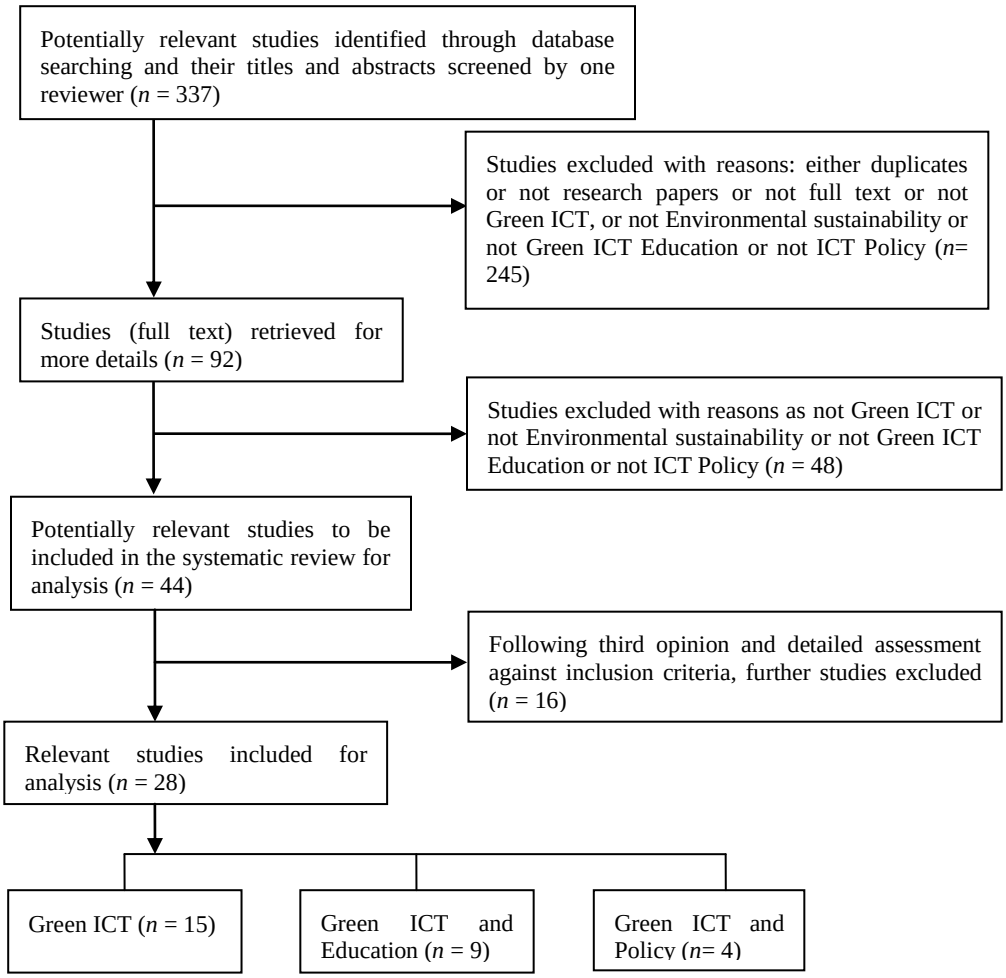
2.3 Systematic Literature Review Results

2.3.1 Available evidence

A total of 337 abstracts were identified (as seen in figure 1). Some of the abstracts didn't meet the full criteria, were not in English, were duplicates, were not research papers, were not full text, were not about Green ICT, were not about environmental sustainability, were not about ICT Education or were not about ICT Policy. As a result 245 abstracts were excluded and only 92 included for further scrutiny. The second level of analysis saw 48 additional abstracts excluded and 44 abstracts accepted. This was after first review and consensus meeting among the three reviewers (SVM, HMS and GKM). Following the third opinion, 16 additional studies were excluded. At the end of the review and analysis process, 28 studies were deemed fit for inclusion.

The results of the screening and selection process are shown in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram (adapted from Moher et al. 2009);

Figure 1: Selection criteria Prisma

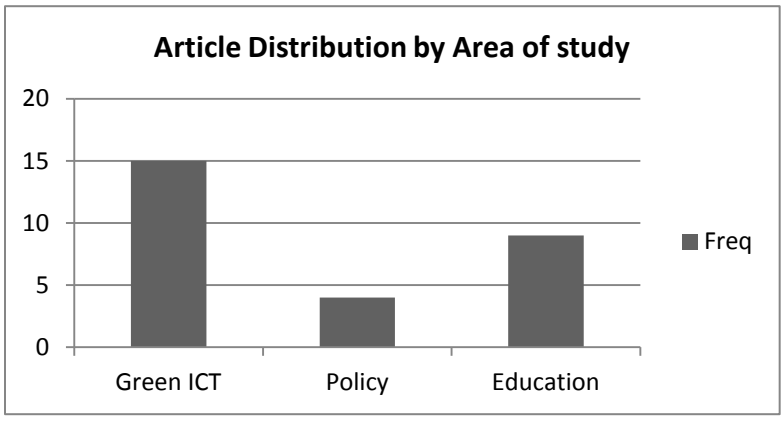


2.3.2 Characteristics of included studies

2.3.3.1 Article distribution by Area of study

Out of the 28 papers; 15 of them mainly focused on Green ICT, 9 focused on both Green ICT and education and only 4 focused on Green ICT and policy. This shows that there is a gap in the area of Green ICT, Education and policy which is the focus of this study. Most of the authors focused on Green ICT while others didn't bring the three together. Figure 2 shows the article distribution by area of study.

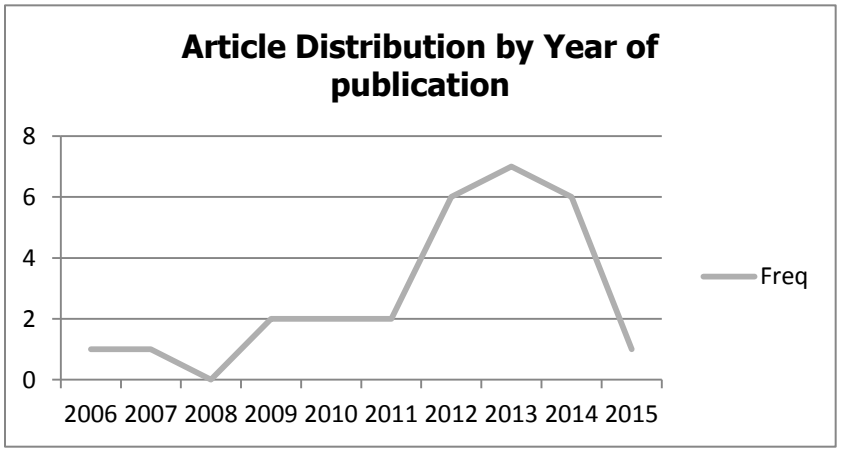
Figure 2: Article Distribution by Area of Study



2.3.2.2 Article distribution by year of publication

The articles included for this study were mostly written between 2012 and 2014 with the highest percentage (25%) written in 2013. This shows the increasing urgency to conduct research on Green ICT. Research by academics in Green IT was lagging behind compared to input from practitioners. This trend is beginning to change after calls upon academics to contribute in the area (Cater-Steel & Tan, 2011; Watson et al. 2010). Figure 3 shows the article distribution by year.

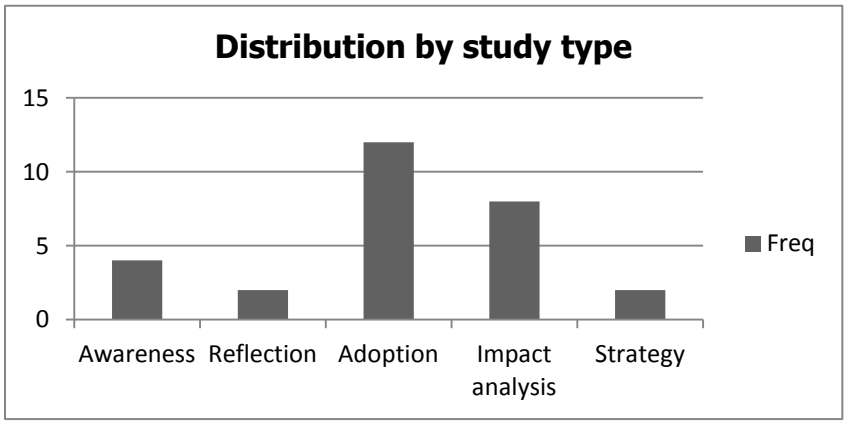
Figure 3: Article Distribution by Year of Publication



2.3.2.3 Article distribution by study type

Most of the articles (12) were about adoption of Green IT in organisations and countries. Articles on impact of ICT on the environment are 8 while those on awareness are 4. Only 2 articles were written about strategy and 2 on reflections on the current practice. This shows that most of the research on GreenIT is mostly on adoption and impact of ICT leaving a gap on research on ways of getting to the awareness and adoption stages. Figure 4 shows the distribution of the articles by study type.

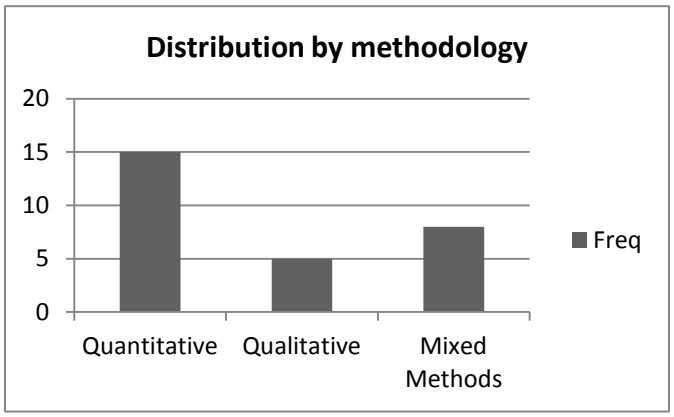
Figure 4: Distribution by Study Type



2.3.2.4 Article distribution by methodology

Most of the articles reviewed followed a quantitative design (54 percent). Only 5 of the papers were qualitative (18 percent) and 8 (29 percent) used mixed methods. One outstanding finding is that most of the papers used secondary data and content analysis. Out of the 28 papers reviewed, only 13 of them used primary data. Figure 5 shows the article distribution by methodology.

Figure 5: Distribution by Methodology



2.3.2.5 Article distribution by country

Most of the papers focused on developed economies; only 4 of them were from Africa. 1 paper attempted to compare Green IT in developing and developed economies. The papers from developed economies offer relevant literature especially in benchmarking for best practices. Table 1 shows the articles per country.

Table 1: Article Distribution by Country

Country	No.	Authors
Nigeria	1	Adu, Enumenu & Oshati, 2014
Kenya	3	Wabobwa, Omuterema, Wanyambi & Omieno, 2013b; Wabobwa, Wanyambi, Omuterema, 2012, Wabobwa, Omuterema, Wanyambi & Mutua, 2013a
Australia	2	Cater-Steel & Tan, 2011; Figueredo & Tsarenko, 2013
India	1	Jain et al., 2013
Pakistan	1	Umair et al., 2015
China	1	Zhang & Liang, 2012
Multi-	19	Akman & Mishra, 2014; Al-Khouri, 2013; Andreopoulou, 2012; Chowdhury,

country		2012; Forge, 2007; Hilty et al., 2004; Hilty, Lohmann & Huang, 2011; Lee et al., 2013; Markovic, Zivkovic, Cvetkovic & Popovic, 2012; Mishra, Akman & Mishra, 2014; Mishra et al., 2012; Molla and Cooper, 2009; Patrignani & Whitehouse, 2014; Rivera et al., 2014; Silvius, et al., 2009; Wang, Shi, Sun, Huisingh & Wang, 2013; Watson et al., 2010; Whitehead, Andrews, Shah & Maidment, 2014; Zapico, Brandt, and Turpeinen 2010

2.3.3 Key themes reported

All the studies highlighted the overarching importance of ICT in environmental sustainability; showing both the positive and negative impacts. Most of the studies focused on discussing Green IT in terms of how ICT impacts the environment (Andreopoulou, 2012; Chowdhury, 2012; Forge, 2007; Hilty et al., 2006; Hilty et al., 2011; Markovic et al., 2012; Patrignani & Whitehouse, 2014; Rivera et al., 2014; Silvius et al., 2009; Umair et al., 2015; Whitehead et al., 2014; Zapico et al., 2010). These articles classified the effects of ICT under the first order, second order and third order effects. Most of the authors however, used secondary data to get the effects. This may be due to the complexity in measuring the effect of ICT with precision.

Some authors conducted studies on behavioural and attitudinal changes towards Green IT (Akman and Mishra, 2014; Mishra et al., 2014; Wabobwa et al., 2012; Wabobwa et al., 2013a; Wabobwa et al., 2013b). These authors attempted to pin the environmental stimuli that cause people's attitudes to change relative to Green IT. All the studies in this category used primary data therefore, they were able to test for motivation and perceived effectiveness of respondents towards adoption of Green IT.

A number of articles focus on the role of education in shaping Green IT (Adu, Emunemu & Oshati, 2014; Figueredo & Tsarenko, 2013; Jain et al., 2013; Mishra et al., 2012; Wabobwa et al., 2012; Wabobwa et al., 2013a; Wabobwa et al., 2013b; Wang et al., 2013; Watson et al., 2012). Education was found an important tool to use to foster both

awareness and adoption of ICT. These studies propose that pedagogy in designing education programs for Green IT is important. Jain et al. (2013) gave a report of a case study of the TERI university; a University in India that focuses on education for environmental sustainability.

Studies on Green IT readiness were also conducted by some of the authors (Akman & Mishra, 2014; Mishra et al., 2012; Molla & Cooper, 2009; Wabobwa et al., 2012; Wabobwa et al., 2013a; Wabobwa et al., 2013b). These articles, except the Molla and Cooper's (2009) paper used primary data to test readiness of people to adopt Green IT. They therefore, give empirical evidence on factors that shape Green IT readiness.

Few studies place focus on how policies shape Green IT (Al-Khouri, 2013; Cater-Steel & Tan, 2011; Lee et al., 2013, Zhang & Liang, 2013). The move towards Green IT is a macro move, one that involves concerted effort from the entire population. In order to achieve such a move, it is important for the government to take over the mantle. This involves formulating policies and even laws on it. There are however, very few papers that focus on ICT policies in Green IT. Al-Khouri (2013) posits that the responsibilities of environmental sustainability should mostly be borne by governments as they formulate and enact policies.

The major themes from the analysis were;

i. The positive and negative ways in which ICT impacts the environment.
ii. Importance of Education and proper pedagogy in fostering Green IT awareness and behaviours.
iii. The importance of policies in shaping people's Green IT awareness and practice.
iv. The paramount role of governments in spearheading Green IT move.
v. The role of academic researchers, journals and IS associations in creating knowledge relevant for Green IT.
vi. The role of demographics such as gender and level of education in determining their Green IT behaviour.

vii. The influence of economic development in shaping motivation and perceived effectiveness of Green IT.

viii. The application of nanotechnology in Green IT.

ix. The subjective norms, attitudes towards behaviour, behavioural intention , actual behaviour, person related beliefs, sector of respondents, experience of respondents and level of awareness that shape Green IT.

2.4 Systematic Literature Review Discussion

This study reviewed papers from 2006 to present and 28 papers were found fit for inclusion. The plight for environmental sustainability was made clear and emphasised by the OECD in 1990. IT has been fronted as one of the most desirable and possible ways of mitigating environmental degradation hence the call to adopt Green IT. IT however, presents both positive and negative impacts; the positive ones outweighing the negative. Therefore, application of Green IT, even though considered a solution has to be done in a planned manner in order to mitigate the negative impact of ICT on the environment.

The review established that despite the many papers written on Green IT, most of them are about impact, awareness and adoption; with very few looking at the role of education and even fewer looking at the role of policies. These two present opportunities of raising awareness of environmental issues and Green IT and also give a guide towards adoption and use of Green IT. The academic sector, even though picking more interest in Green IT as is evidenced by some programs offered and the academic conferences and conference plenary specifically for Green IT has lagged behind. In some of the articles reviewed, the academic sector has been called to join in the issue of Green IT owing to their immense potential contribution both in the area of research and education. Some of the papers have also called upon Governments to learn from countries such as USA and Japan that are already adopting Green IT in order to formulate policies that are in line with sustainability of the environment in light of ICT.

The studies on awareness and adoption of Green IT found that it is significantly shaped by demographics such as the gender and level of education of the persons involved. It was established that females are more willing to adopt Green IT (Wang et al., 2013). Persons with a higher level of education and specifically in the area of IT were found to be more aware and more willing to adopt Green IT. This underscores the significance of incorporating Green IT in education in order to produce more graduates who are aware of environmental sustainability. In Silvius (2009) it was stressed that it is time to produce project managers who are aware of their responsibility towards the environment.

It has also been established that most of the articles reviewed were based on developed economies. There are very few studies based on developing economies and even fewer focusing on Africa. One article (Wang et al., 2013) places focus on both developed and developing economies and found that differences in economic development between the two economies make green implementation different; therefore, both categories have to adopt strategies that are suitable for their economic context. Hence there is a need to conduct more studies on developing countries in order to formulate strategies that can work for them. No related paper was found focusing on Uganda specifically even with the growth of ICT. Therefore, this study will present novel findings about Green IT in Uganda one of the SSA countries.

2.5 Systematic Literature Review Conclusion

The call for environmental sustainability has been voiced in many gatherings and written about by both practitioners and academicians. This has seen a number of countries adopting it and creating awareness; most notable of them being USA, Japan, Korea, Denmark and UK. Other countries like Australia have also developed government led strategies towards environmental sustainability. However, due to differences in economic set up, these successes cannot merely be migrated to the developing countries, they have to be implemented in consideration of their economic and social situation. ICT has been fronted as a key enabler for environmental sustainability but countries like Uganda are barely aware of how it can be adopted for the same. Therefore, the ICT roll out is not

aligned with the environmental concerns. Continuing in this trend is likely to cause a situation where ICT use mostly presents a negative impact on the environment instead of using it to ensure its sustainability.

This paper has limitations of scope; papers written before 2006 were not looked at. Also we conducted an exhaustive review with selective citation; we got papers from only particular databases and libraries. An exhaustive review would have been preferred but due to the plethora of articles on Green IT extant in many journals, a limitation had to be enforced. To ensure only good quality articles are used in the study, only peer-review journal articles were considered. This meant the exclusion of conference papers and non-peer reviewed articles that had related literature.

2.6 Literature Assessment

2.6.1 Introduction

This section will review the extant literature selected using the methods in section three above. Only journal articles included in the systematic literature review in section three have been reviewed here.

2.6.2 Concept of environmental sustainability

Environmental sustainability is one of the most pressing global issues of our times (Markovic et al., 2012; Watson et al., 2010). This has been made worse by many people moving to urban places leading to either expansion of cities or building of new cities; urban places account for 80% of the global carbon emission (Markovic et al., 2012). There is an urgent need to move towards a Green economy; one with improved human well-being and social equality with reduced environmental risks and economic growth (Zhang & Liang, 2012). ICT has been cited as the most important strategy for managing environmental sustainability and hence moving towards having a green economy (Markovic et al., 2012; Zhang & Liang, 2012).

The effects and impact of ICT on the environment are both positive and negative (Al-Khouri, 2013; Forge, 2007; Hilty et al., 2004; Rivera et al., 2014; Silvius, Brink & Smit, 2009; Zapico et al., 2010; Zhang & Liang, 2012). A 2007 study by Gartner estimates that the current practices and forms of ICT use contribute 2% of global emissions (Andreopoulou, 2012; Chowdhury, 2012; Lee et al., 2013; Mishra et al., 2014) which is equivalent to contribution from the aviation industry (Cater-Steel & Tan, 2011). This figure is estimated to double by 2020. On the other side, appropriate use of Green IT is estimated to reduce global emissions by 15% while reducing energy consumption worth Euro 500 billion by 2020. It is however, difficult to estimate the energy consumption of the Internet because of its global dimension and different means of accessing it. A 2011 study by UC Berkeley estimates that the Internet consumes 170 – 307 GW (Giga Watt) of electricity accounting for 1.1 – 1.9% total usage of humanity (Chowdhury, 2012). Whitehead et al., (2014) state that it is difficult to measure with accuracy the effect of ICT (specifically data centres) on the environment due to the many metrics used.

The effects of ICT on the environment have been classified under three categories that will guide this study;

First order effects; these are impacts created by the physical existence of the ICT and the manufacturing process. These effects are caused by ICT hardware during their lifecycle (Forge, 2007, p.4; Hilty et al., 2006; Rivera et al., 2014; Silvius et al., 2009). Among these are effects due to pollution, the energy used to manufacture the ICT and effects from disposal after use. These effects can broadly be categorized as Green in IT effects (Hilty et al, 2011).

Second order effects; these include both the positive and negative impacts of the ongoing use of ICT in terms of energy dissipated in the use of ICT and also the energy saved due to the use of ICT (Forge, 2007, p.4; Hilty et al., 2006; Rivera et al., 2014; Silvius et al.,

2009). They are effects that ICT causes on other processes. These can be broadly categorized as Green by IT or Green through IT (Hilty et al., 2011).

Third order effects; these are impacts arising from many people using ICT over a period of time. They include effects of reduced movements due to alternative means of communication afforded by ICT (Forge, 2007; Hilty et al., 2006; Silvius et al., 2009). They indirectly affect the first and second order effects by changing economic structures and lifestyles (Rivera et al., 2014).

2.6.2.1 First order effects

Manufacture of ICTs

ICTs possess hazardous materials during manufacture; effects of these materials are the same during the recycling phase. All these have to be taken into consideration in the plight for sustainability. For example, Forge (2007) notes that the EU states do not recycle plastics to avoid brominated furans and dioxins. This standard is however, not maintained in developing countries where recycling is done by hands by children.

Pollution

ICT has both a positive and negative contribution towards pollution of the environment. On the positive side, it enables waste and materials management (Forge, 2007; Zhang & Liang, 2012), product to service shift with virtual goods on the rise (Forge, 2007), the procurement cycle (Molla and Cooper, 2009). However, despite having virtual goods and the rise in teleshopping, the materials used for packaging of ICTs and other products for additional protection during transportation increase waste. Research also indicates that some IT equipment like copiers and printers may introduce unhealthy solids and gases such as dust, brominated flames retardants, organotonins, phthalates, particles and fibres, ozone, volatile organic compounds and ammonia (Bonvoisin, Lelah, Mathieux & Brissaud, 2014; Forge, 2007).

Disposal of ICTs

ICT equipment has short life spans, requiring continuous disposal (Al-Khouri, 2013). Even though some ICT companies plan for obsolesce of ICT devices, many times this is not achievable because the cost may be as high as the cost of replacing them. Forge (2007) places the life span of most ICT devices as; an average of 12 months for mobile phones, 3 years for laptops and 3-5 years for desktops. Due to the reducing prices of these devices and the consumerisation behaviour of users, their demand has gone high and will keep going higher.

Some developing countries have mechanism for disposing of ICT equipment; however, the developing countries that have them in most cases do not use protective gear for these workers. There is a rising pollution due to incineration residues and waste in landfill sites. The concept of re-use in most cases results in computers being shipped to developing countries in Asia and Africa; these are then re-used briefly and then dumped in environmentally unfriendly ways (Al-Khouri, 2013; Umair et al., 2015). According to United Nations Environmental Program (UNEP) report (Al-Khouri, 2013) it is estimated that countries like India will have an e-waste increase of 500% in the next 10 years. Umair, et al. (2015) further state most of the recycling processes of the e-waste computers shipped to developing countries are done manually in densely populated areas, thereby affecting many people. With the wide growth of mobile phone users, it is expected that by 2020, there will be 5 billion mobile phone users around the world (Forge, 2007). This just exacerbates the problem of disposal of these mobile devices; especially the smart phones. Silvius et al. (2009) fronted ICT as an enabler for waste management; therefore, even though it leads to increase in e-waste it also enables waste management.

2.6.2.2 Second order effects

Energy consumption

Many organisations have data centres, however, the cost of running these data centres are underestimated. Forge (2007) classifies the costs of running these data centres as; energy to power them, the energy to manage the heat emitted due to their use and the cost of them driving up carbon dioxide (Co_2). A large data centre consumes about 9.6 MW of energy to power and cool (Forge, 2007, p.11). Data centres alone contribute a quarter of all emissions from IT use and have the highest growing carbon footprint (Whitehead et al., 2014). IT alone consumes 20% of the energy use, while in other offices the consumption can go to 70% while the carbon footprint will triple between 2002 and 2020 (Mishra et al., 2012). Whitehead et al. (2014, p.153) estimates that there were 2 billion PCs including laptops globally in 2015. Many of these PCs run on the Internet. The demand on power in the UK for example is estimated to head towards outstripping supply by 2017 if nothing is done (Whitehead et al., 2014). Forrester Research established that electricity used by a data centre with 1,000 servers is adequate to power 16,800 homes for a year (Al-Khouri, 2013). However, while increased consumption of ICT has increased energy use, less energy-intensive ICT sector can also reduce consumption of energy in other areas. A 15% reduction of energy due to ICT consumption however, causes a 22% increase in Co_2 emission (Rivera et al., 2014). Al-Khouri (2013, p.203) states that the carbon footprint of one Google search is equivalent to an 11-Watt light bulb left on for one hour; Google processes over a billion queries per month. The Global e-Sustainability Initiative (GeSI) estimated in 2008 that IT can help reduce annual Co_2 emissions by 7.8 billion tons (15 percent) by 2020 (Lee et al., 2013, p.632).

Cost of software in global warming

Software affects the environment due to its need for powerful hardware to operate. For example, for one to have the most powerful operating system, they have to invest in equally good hardware. This situation is made worse by planned obsolesce; a situation whereby manufacturers keep releasing newer and more powerful software every while. These newer versions sometimes dictate that the organisation should also have better hardware leading to disposal of the hardware. According to Forge (2007), the migration

from Windows 98 to Windows Vista caused approximately a shoot of 40 times for memory requirements and 15 times for CPU power and speed.

Use of ICT also leads to space rebound (Rivera et al., 2014). This can be seen from the reduction in sizes of some ICT products, hence occupying less space. It also leads reduction of warehouses due to ability to adopt Just in Time by organisations. ICTs enable a company to order (for example using Supply Chain Management Systems) so that products are delivered when demanded. This has an effect on reducing space to store products.

2.6.2.3 Third order effects

Third order effects of ICT are mostly positive; the collective benefits that arise from many people using ICTs (Forge, 2007). ICT enables alternative means of communication without necessarily physical movements. They bring about dematerialisation and virtualisation by affording means to move from physical products and services to virtual ones (Bonvoisin et al., 2014; Hilty et al., 2011; Watson et al., 2010; Whitehead et al., 2014; Zapico et al., 2010; Zhang & Liang, 2012). Hilty et al. (2011, p.14) put forward the increasing importance of ICT in facilitating resource decoupling; which "decreases the rate of a use of resources per unit of economic activity". As a result, it is possible to have video-conferencing, e-business, telemedicine, e-learning, e-government, among others. This reduction in movements translates to reduction in gas emissions from transport modes and reduction in fuel consumption.

Other positive effects include optimization, whereby sensors can be used to track invisible environmental variables with precision to improve efficiency of use (Al-Khouri, 2013; Andreopoulou, 2012; Bonvoisin et al., 2014; Zapico et al., 2010). Additionally, the reliance on materials such as paper can be reduced using ICT. For example, one can read using e-readers instead of from print. Other services such as banking have also been converted to e-banking, thereby a possibility of reducing paper used. ICT can be used for

behavioural change as a means to communicate the desired change and actions to be taken including environmental information (Adu et al., 2014; Andreopoulou, 2012; Zapico et al., 2010).

Rivera et al. (2014, pp. 112-113) explained the methods that can be used to analyse the effects of ICT on the environment. These include; economic assessment (through quasi-experimental studies or econometric analysis using secondary data), Scenario methodology (using scenarios and future studies to deal with uncertainties), social practice approach (by conducting an ethnographic and anthropological theory) and environmental assessments (using Life cycle analysis).

The negative effects of ICT can be reduced by developing sophisticated software and business systems to help reduce Green House Gas (GHG) emissions, developing improved technologies for manufacturing ICT equipment and by sharing computing and ICT infrastructure. Chowdhury (2012) posits that if Green behaviour is cultivated among users, information retrieval tools and content are re-used, ICT equipment and infrastructure are shared and content creation, organisation and processing is standardised, it will then be possible to achieve Green information retrieval. Markovic et al. (2012) propose nanotechnology as a means towards Green IT due to their ability to reduce size and energy consumption of ICT equipment. This is through their use of integrated circuits, electronic manufacturing equipment (atomic layer deposition and NIL (nanoimprint lithography), displays and graphenes (OLED (organic light emitting diode) and FED (field emission display), data storages (MRAM (magneto-resistive random access memory), FeRAM (ferro-electric RAM), RRAM (resistive RAM) and NRAM (nanotube RAM) and quantum computing.

Hilty et al. (2011) posit that the potential of Green ICT is heightened through sustainable human-computer interaction. They argue that sustainable interaction design (SID) should be at the forefront in order to design and develop ICTs that can support sustainability through its life cycle. This can be done by designs that encourage longer use, transfer of

ownership and proper disposal (Hilty et al., 2011, p.20). They categorise it under sustainability through design (design that promotes sustainability behaviour and lifestyle) and sustainability in design (designing sustainable technology).

The positive impact of Green ICT is however, not as straight forward as it may seem; it comes about with rebound effects (Jevons paradox). This is a situation whereby ICT potentially reduces resource constraint (resource decoupling) but increases the use of the resource at the same time (Andreopoulou, 2012; Hilty et al., 2011; Rivera, 2014). For example, it can lead to rematerialisation whereby ICT increases the use of a product or service due to its convenience hence reversing dematerialisation and profligate consumption of products and services. Chowdhury (2012) posits that dematerialisation in terms of moving from printed books to online books makes them more accessible, leading to increase in their demand and an increase in the use of the Internet and other ICT equipment and energy. Also virtualisation reduces movement through e-commerce but increases demand of products, which are packaged more thoroughly to avoid damage during transit, hence increasing packaging materials. Additionally e-commerce necessitates faster delivery of goods bringing about a need to send half empty tracks (Rivera et al., 2014). Therefore, the impact of reduced movements, which may reduce Green House Gas (GHG) emissions, is difficult to estimate.

The World Wide Fund (WWF) in 2008 summarised the Greening by IT of leading countries as; smart city planning, smart buildings, smart appliances, dematerialisation services, I-optimisation, smart industry, smart grid, integrated renewable solutions, smart work and intelligent transport (Lee et al., 2013, p.633). This clearly highlights the over arching role of Green IT.

2.6.3 Concept of Green IT

The term Green IT has been described in many ways by different scholars and organisations (Molla & Cooper, 2009; Wabobwa et al., 2013b; Wabobwa et al., 2012,

Wabobwa et al., 2013a). Mishra et al., (2012) define it as information technology and systems initiatives and programs aimed at addressing environmental sustainability. Cater-Steel and Tan (2011) look at it as the study of designing, manufacturing, using and disposing of IT equipment in ways that will not be very harmful to the environment while improving their economic viability and system performance and use. It comprises technologies and techniques used to improve energy efficiency of data centres, technologies and techniques for reducing environmental impact of IT operations and the general adoption of IT as an enabler of green initiatives within an organisation (Molla & Cooper, 2009). Patrignani and Whitehouse (2014) formulated the concept of Good (technology that doesn't damage the environment), Clean (the organisation wide approach to ICT) and Fair (technology that augments well-being) ICT. They advocate that in order to ensure environmental sustainability, ICT should be manufactured aesthetically in order to improve the human interaction and experience, it should be handled in an environmentally friendly way throughout its life cycle from manufacture to disposal and also it should be open so that other users can easily develop and program it to ensure innovation, re-usability and recycling. Green technology processes have been broadly classified as end of pipe technologies; that reduce environmental impact of technologies without changing their processes and clean technologies; where the processes are changed to reduce the level of environmental impact (Patrignani & Whitehouse, 2014). Green IT has been broadly categorised as Green of IT; which means improving the IT itself to reduce energy and carbon dioxide emissions for example through development of cloud computing and Green by IT; which means using IT for greening purposes for example through E-commerce and paperless offices (Lee et al., 2013; Zhang & Liang, 2012). Molla and Cooper (2009) put forth the perspectives of Green IT as sourcing perspective (environmentally preferred IT purchasing), operations perspective (improving energy efficiency in powering and cooling corporate IT assets and reducing IT induced greenhouse gas emissions), system perspective (the role of IT in supporting the organisation's overall sustainability plans) and end of life perspective (reusing, recycling and disposing IT).

Green IS on the other hand is more encompassing and broader than Green IT (Watson et al., 2010). It involves use of IT to support the organisation's overall sustainability initiatives; it therefore, involves IT and the people as well. Watson et al. (2010, p.24) define it as "an integrated and cooperating set of people, processes, software and information technologies to support individual, organisational or societal goals". While Green Computing is the discipline that studies, develops and promotes techniques for Green IS (Mishra et al. 2012).

A country or organisation has to become ready to implement Green IT for it to become successful. Molla and Cooper (2009) developed a framework for Green IT readiness, where they posited that there should be the right attitude, practice, policies, governance and technology for it to become successful. Their study was however, conducted in developed countries. Wabobwa (2013) conducted a similar study in a developing country and found that demographics play a significant role in determining Green IT readiness. Among the demographics, they found that education and training is an important factor in determining ones awareness and adoption of sustainability initiatives. A Green IT value model by Chou and Chou (2012) proposed awareness, translation, comprehension and Green IT value to have an impact on Green IT (as cited Mishra et al., 2014).

2.6.4 ICT Education and Green ICT

Mary McKinlay; the Vice President of the International Project Management Association (IPMA) at the 22nd World Congress of the IPMA held in 2008 pointed out that it is time for project managers to not just "do things right" but "do the right things right" (Silvius et al., 2009, p.33). The role of education in fostering environmental sustainability has been supported by many authors (Figueredo & Tsarenko, 2013; Jain et al., 2013; Mishra et al., 2012; Wabobwa et al., 2013a; Wabobwa et al., 2013b; Wabobwa et al., 2012; Wang et al., 2013). According to Adu et al. (2014) education is not only a means of enabling progress and preventing poverty but also aid in developing knowledge societies and economies. Therefore, learning that doesn't cause a mind shift towards the abuse of the environment is a failure (Figueredo & Tsarenko 2013). The UN, in its Millennium

Development Goals (MDGs) emphasized the role of universities, education and training in achieving sustainability (Adu et al., 2014; Jain et al., 2013).

Mishra et al. (2014) put forward that Green IT awareness and adoption is still in infancy in many organisations because of knowledge gaps, practice gaps, opportunity gaps, and knowledge-doing gaps. In their study, Figueredo and Tsarenko (2013) conclude that students have to be made aware of the environmental issues for them to willingly participate in sustainability programs. They also place a strong emphasis on the role of universities in promoting educational activities on sustainability initiatives. This has been supported by Jain et al. (2013) who conducted a case study on TERI University; a university that focuses only on education for environmental sustainability and found that it is important to develop pedagogy for Sustainable Development through education, research and outreach. Mishra et al. (2012) conducted a study to review Green IT curriculum from various universities. From their review, these universities teach course modules such as; ICT and the Environment, Green Computing Technologies, Developing Green IT strategies, Sustainable Computing, Responsibly Green, Politics, Science and Business of Sustainability, Technical Strategy and Planning, Procurement and Management Support among others.

Wabobwa et al. (2013a) conducted a study on Green IT readiness (G-Readiness) and found that a person's academic qualifications have a significant effect on their use of ICT to minimise carbon emitting business practices, improvement of energy efficiency of data centres, reduction of the costs of running data centres, reduction of ICT's contribution to green house gas emissions and compliance with green regulatory requirements. The more educated one is, the more they are willing to adopt Green IT. They also found that a person's ICT qualifications have a significant effect on their reduction of the costs of powering ICT infrastructure, awareness to purchase more environmentally friendly ICT technology, reduction of ICT's contribution to green house gas emissions and compliance with green regulatory requirements. These go to indicate the contribution of education towards Green IT. According to Cater-Steel and Tan (2011) ITILv3 (IT Infrastructure

Library) provides guidelines for Green IT even though it doesn't explicitly mention it. The 5 guidelines; Service Strategy, Service Design, Service Transition, Service Operation and Continual Service Improvement can be applied across IT service management (ITSM) in the procurement of IT services, consolidation of IT, power monitoring and management and decommissioning. ITILv3 however, provides guidelines to the internal environment like temperature and power consumption and not the external environment; carbon dioxide emission and effects on global warming.

Aside from the role of education in the implementation of greening initiatives, Wang et al. (2013) also found that the economic-development of a country or organisation also affects the initiatives. They posit that the implementation differs according to whether the economy is developed or emerging. However, both economies require motivation and perceived effectiveness to ensure implementation; hence the important role of education and knowledge. They also found that females are more willing to implement greening initiatives than males. In most developing countries, there is mismatch in the gender make up of students; with male students outnumbering female ones.

However, the IS academia, until recently was not actively participating in Green IT (Andreopoulou, 2012; Watson et al., 2010). Watson et al. (2010) posit that a move towards Green IS should be a concerted effort from various stakeholders. They however, note that academia has played a back row role in environmental sustainability. In their position paper, they therefore, make a call to researchers, teachers, journals and IS associations to participate in Green IS. They elaborated the impact of print journals on paper, and the cost of conferences that only go to make environmental sustainability difficult to achieve. They propose that environmental issues should be added in traditional courses such as system analysis and design to augment sustainability. Watson et al. (2010) conclude that IS students who have been exposed to environmental sustainability at the university become more informed IS professionals and therefore, make consideration for the impact of IT on the environment when selecting new technology and software. Silvius et al. (2009) conclude that project managers need

training in sustainability, inclusive of environmental sustainability; students should be educated and trained in the same to achieve it. Therefore, it is important to have educational programmes to support awareness of Green ICT which will in turn influence a person's Green ICT practice through incorporating sustainability in the curriculum.

2.6.5 ICT policies and Green ICT

According to Al-Khouri (2013) many countries have e-government plans that do not cater for environmental sustainability. Governments may have priorities, that include environmental sustainability but as the plans trickle down to e-government plans, sustainability is not mentioned despite the opportunities afforded by Green IT. The author emphasised the need for governments to develop policies and a communication strategy and regulate e-government from an environmental perspective. Governments should also have policies to guide energy efficient ICT devices to cut down on power consumption.

According to Lee et al. (2013, pp.634-638) the leading countries in Green IT initiatives are; USA spearheaded by Environmental Protection Agency (EPA), Department of Energy (DoE) and General Services Administration (GSA). Japan with the New IT Reform Strategy under the IT Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society, the Prime Minister's office, Ministry of Internal Affairs and Communication (MIC), Ministry of Economy, Trade and Industry (METI). Korea led by the Ministry of Public Administration and Security (MOPAS), the Ministry of Knowledge Economy (MKE), and the Korea Communications Commission (KCC). UK with "Greening Government ICT: Efficient, Sustainable, Responsible", Office of Communications (Ofcom), Department of Energy and Climate Change (DECC) and Denmark spearheaded by the Ministry of Science, Technology and Innovation (MSTI) and the National IT and Telecom Agency (NITA).

Lee et al. (2013) posit that some governments like Japan are investing in Green IT in form of support in research and innovation. They add that leading countries in IT are

strengthening power consumption regulations and using environmental requirements as non-duty trade barriers. They propose that for Green IT to become successful there needs to be a close cooperation between the public and private sector.

Europe in February 2003 adopted law formulated by the Waste Electrical and Electronic Equipment Directive (WEEE) and the Directive on the Restriction of the use of certain Hazardous Substances in electrical and electronic equipment (RoHS) that places the responsibility of the disposal of electronic waste on the manufacturers of the equipment (Cater-Steel & Tan, 2011). Countries like United States have guidelines for ICT procurement by government agencies; for example 95 percent of new ICT acquisitions must be compliant with Energy Star or the Federal Energy Management Program, or certified by the Electronic Product Environmental Assessment Tool (EPEAT), contain recycled content, or otherwise be more sustainable than other products, should have energy-efficient servers and practice double-sided printing (Cater-Steel & Tan, 2011, p.9).

Zhang and Liang (2012, p.1003) established that there is always a discrepancy between what is formulated and what is implemented in terms of Green IT policies because it is done through bargaining within the Political process. They also posit that regulations and policies are not in tandem with the industry practice. Thus the industry practice is ahead of the regulations and policies.

Zhang and Liang (2012, p.1003) also formulated an analytical framework based on innovation systems approach to help formulate policies on Green IT. These are formulated basing on actors (players of the game such as organisations), networks of actors (relationships between actors), institutions (rules of the game; both laws and regulations and culture) and infrastructure (physical and knowledge infrastructure). During formulation of policies, they propose that priorities should be assigned to the most stringent obstacles for green innovation.

Al-Khouri (2013) summarises that the onus for environmental sustainability should be on the governments and not merely organisations. This is due to the need for a concerted effort from all stakeholders for it to become successful. Umair et al. (2015) in their conclusion posit that many countries have ICT rules and regulations to guide reuse and recycling but most times, due to the black market nature of the undertaking, they are not enforced. This leaves many stakeholders; including the workers, local community, society and value chain actors exposed to health hazards arising from the effect of ICT on the environment. They state that despite the negative impact it has on the environment, it contributes to economic standing of the stakeholders and hence an asset for the country. They therefore, advocate for better and safer ways of recycling these materials.

Cater-Steel and Tan (2011) designed the framework of initiatives contributing to Green IT Service Management as comprising procurement of power efficient hardware, consolidation of IT resources, power monitoring and management and decommissioning of IT equipment. They however, found that mostly two of the four initiatives; Power consumption analysis and decommissioning are being followed in Australia. Not much has been done in Procurement and consolidation of IT. Fernandez, Junquera and Ordiz (as cited in Mishra et al., 2014) concluded in their study that strong environmental performance is likely to attract, motivate, and retain skilled employees in organisations. Therefore, its effect is two sided.

2.7 Theoretical Framework

2.7.1 Belief Action Outcome Model

The Belief Action Outcome (BAO) model was developed by Nigel P. Melville to explain the relationship between information systems and environmental sustainability. This relationship involves human behaviour and social, organisational and environmental perspectives (Melville, 2010). The theory is based on the micro-macro relations propounded by Coleman (1986, 1994) that looks at three classifications of sustainability (Melville, 2010). Coleman looks at sustainability as; how the cognitive states of

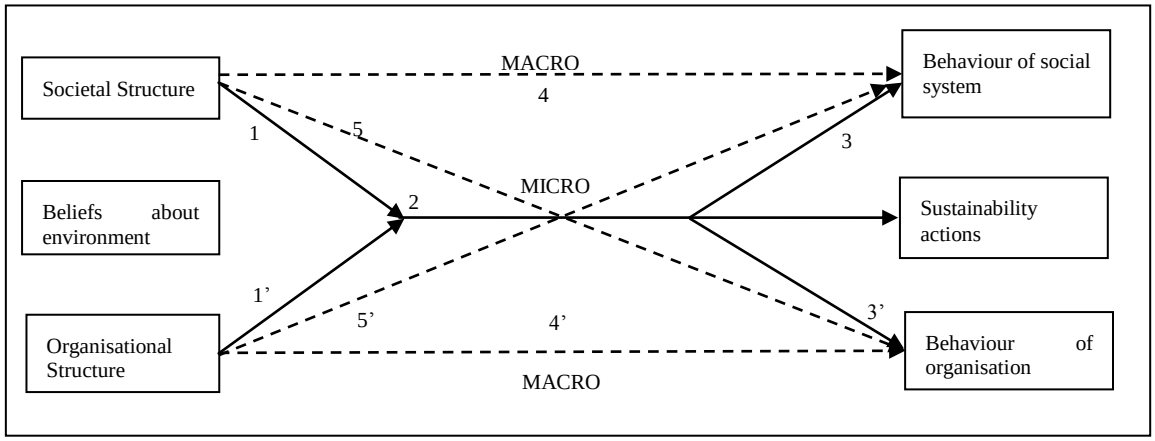
sustainability arise, the sustainability practices of both individuals and organisations and the environmental and financial performance. Therefore, the level of analysis is both micro and macro.

The model explains how individuals view ICT as a solver of all problems but in the end over uses it till they deplete natural resources and then try to use it to avert the depletion. The independent variables tested in the model are societal structure and organisational structure while the dependent variables are beliefs about the environment, sustainability actions, the behaviour of social system and the behaviour of the organisation. According to the theory, there are three types of relations; how the social structure affects the psychic states of one's beliefs, desires and opportunities (macro-level variables), how psychic states affect individual action (micro-level variables), and how a combination of individual actions affect the behaviour of the social system (macro-level variables) (Gholami, Sulaiman, Ramayah & Molla, 2013; Mithas, Khuntia & Roy, 2010; Molla, Abareshi & Cooper 2014). Social systems include both individual and corporate actors (Coleman, 1986).

Melville (2010) further introduces the organisational structure and behaviour of organisation that leads to dual socialisation and dual outcomes. The dual socialisation is how the individual psychic is shaped by social structure (labelled 1 in the diagram) and organisational structure (labelled 1'). An individual's belief formation is shaped by the conflicts between the values of the organisation such as profits and personal values which are formed by the expectations of the society to save the environment. The dual outcomes are how the combination of individual actions may improve organisational performance (labelled 3') and environmental performance (labelled 3). The cost expended and effort of an individual should be seen to improve both the organisational and environmental performance. Organisations are homogenous agents comprised of many individuals with different behaviours who are influenced by the society (labelled 4, 4', 5, 5').

The BAO model is illustrated in figure 6;

Figure 6: The Belief Action Outcome Model



Source: Melville (2010, p.6)

According to the model, the macro levels (social structure) affect the psychic state of an individual (Labeled 1). The psychic state in turn affects the individual actions (Labeled 2). Individual actions cumulatively affect the behaviour of macro level variables such as the social system (Labeled 3).

Table 2: The Belief Action Outcome Terminology

	Belief Formation	**Action Formation**	**Outcome**
Description	How psychic states (beliefs, desires, opportunities, etc.) about the natural environment are formed.	How psychic states about the natural environment translate to actions.	How sustainability actions affect social and organisational systems. How macro states affect behaviour of society and organisations.
Analysis Level	Macro–micro	Micro–micro	Micro–macro (links 3

			and 3'). Macro–macro (links 4, 4', 5, and 5').
Constructs	**Societal structure**: Cultural or normative patterns that define expectations of agents about each other's behaviour and that organise enduring interrelationships.† **Organisational structure**: Ways in which an organisation divides its labour into distinct tasks and achieves coordination among them.‡ **Psychic state**: Beliefs, desires, opportunities, etc.	**Action**: Something done by an individual, such as adoption of an information system to improve organisational recycling or facilitate ride sharing.	**Behaviour of society**: Functioning of society and natural environment (includes performance). **Behaviour of organisation**: Functioning of organisation (includes performance).
Example Studies	Integrated assessment using a designed information system changed individual beliefs about risks of climate change (Schlumpf et al. 2001).	Belief that reducing greenhouse gas emissions is critical to sustainability leads to adoption of social networking site encouraging energy conservation (Bottrill 2007).	IT investment in services and most manufacturing sectors increases electricity demand, with implications for greenhouse gas emissions (Cho et al. 2007).

Source: Melville (2010, p.6)

†Lopez and Scott (2000, as cited in Melville, 2010).

‡Mintzberg (1979, as cited in Melville, 2010).

However, the model is generic and can be used in many studies. Also the model doesn't have a definite outcome (it measures sustainability actions, beliefs about the environment, behaviour of social system and organisation as the dependent variables). The model categorises beliefs about the environment under dependent variables but places it under independent variables in the figure even though it has a mediating effect in the relationship between societal structure and sustainability actions and organisational structure and sustainability actions.

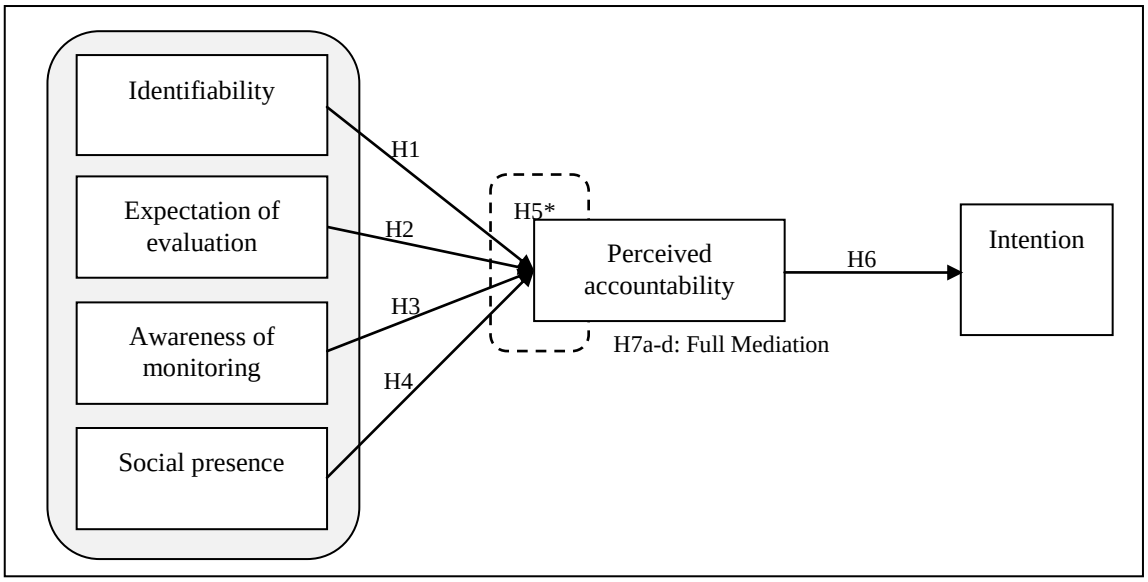
The study will adopt societal structure, organisational structure, beliefs about the environment and sustainability actions due to their close relatedness to the study. These variables will help measure how the society and organisation affect sustainability actions with mediation from beliefs about the environment. The behaviour of the social system and behaviour of the organisation are not the purview of this study and therefore, will not be adopted. Therefore, analysis will be done at a micro level with individuals making the unit of inquiry and analysis. Studies such as those of Gholami et al. (2013) and Molla et al. (2014) applied the BAO model at the individual unit of analysis rather than the organisation. As a result of these short comings, the study will triangulate it with another theory in order to overcome its weaknesses.

2.7.2 Accountability theory

The Accountability theory was developed by Tetlock, Lerner and others to describe how a person makes decisions and follow up procedures basing on the perception of justifying their actions to others that they feel accountable to (Vance, Lowry, & Eggett, 2013). Vance et al. (2013) distinguish accountability under accountability as a virtue (a positive entity where a person willingly accepts responsibilities) and accountability as a mechanism (knowledge that a person has to justify his actions to another who can pass judgment on them for their actions).

Lerner and Tetlock (1999) posit that accountability is not a unitary phenomenon. They state that "even the simplest accountability manipulation necessarily implicates several empirically distinguishable submanipulations" (p.255). As a result, they put across the constructs of the accountability theory as; identifiability, expectation of evaluation, awareness of monitoring and reason giving or social presence (Lerner & Tetlock, 1999, pp.255-256). These factors influence a person's perceived accountability that ultimately influence a person's intention to do or not to do something. Identifiability is a person's awareness that their work can be linked to them and thereby exposing their true self (Lerner & Tetlock, 1999). Therefore, if a person believes that his work will be linked back to him, he is more inclined to do a better job at it. Expectation of evaluation is the belief that a person's work will be assessed by other persons basing on some rules and regulations with ensuing consequences (Lerner & Tetlock, 1999). Expectation of evaluation increases one's focus to engage in socially acceptable behaviour. Awareness of monitoring is the cognition that one's work is continuously being monitored. When people are aware that there is an audience monitoring what they are doing, they usually work in conformity with the known expectations (Lerner & Tetlock, 1999). Social presence is awareness of the presence of other people using the same system. Frink and Klimoski (2004) posit that accountability can be in form of accountability of an agent to an audience/principal or self accountability. This means that aside from agent expecting to be held accountable by the audience, the agent also holds him/herself accountable. The Accountability theory has been used in IS research to explain accountability of IS users (Eargle, Vance & Lowry, 2013; Vance, Allen, Molyneux & Lowry, 2010; Vance, Lowry & Eggett, 2015; Vance, Molyneux, Lowry & Eggett, 2011). The accountability theory is illustrated in figure 7;

Figure 7: Accountability theory



Source: Vance, Lowry, & Eggett (2015, p. 348)

According to the theory as applied in the study by Vance et al. (2015), end-users IS artifacts are used to ensure accountability through identification, evaluation, monitoring and collective use. The end-users are made aware of these artifacts and in turn their perceived accountability is increased which reduces their intention to violate access the policy.

Some theorists have concluded that accountability doesn't affect what a person thinks about but only what they willing to publicly say they are thinking about (Lerner & Tetlock, 1999). Therefore, a person will only maintain an action until the time he/she believes the audience is no longer salient. Social systems however, comprise of many people whose actions are bound by accountability that ensure the order and maintenance of that system (Frink & Klimoski, 2004). The unit of analysis in most accountability studies is usually an event (the decision to be made) but also relationships (accountability expectations between agents and principals) can be studied (Frink & Klimoski, 2004).

Therefore, to augment the BAO model; which is a micro-macro model some constructs of accountability theory will be adopted in this study. Specifically identifiability, evaluation

and monitoring constructs will be adopted. These will help investigate how an individual's identifiability, expectation of evaluation and awareness of monitoring will shape his or her sustainability actions within a social system. The study will adopt constructs from the belief action outcome model and the accountability theory in order to triangulate and design a conceptual framework. Societal structure, organisational structure, beliefs about the environment and sustainability actions are adopted from BAO of Melville (2010) while identifiability, expectation of evaluation and awareness of monitoring are adopted from the accountability theory of Lerner and Tetlock (1999) as shown in Table 3;

Table 3: Selected Constructs

Theory/Model	**Construct**	**Adopted**	**Justification**
Belief Action Outcome Model	Societal structure	√	The societal structure; normative patterns and cultural norms shape a person's awareness and beliefs about the environment.
	Organisational structure	√	The organisational structures in form of campaigns geared towards managing the environment shape beliefs about the environment.
	Beliefs about Green ICT	√	A person will only use ICT based sustainability actions if he believes it is important to conserve the environment. This construct will be used to measure how one comes about to practice ICT based sustainability actions.
	Sustainability actions	√	In order to achieve Green ICT, there have to be sustainability actions done by ICT users. Sustainability actions lead to Green ICT, which is the main criterion variable

			of this study.
	Behaviour of social system	×	Behaviour of social system measures how sustainability actions lead to functioning of the society and natural environment; which is not the purview of this study.
	Behaviour of organisation	×	Behaviour of organisation measures how sustainability actions lead to performance of the organisation including financial performance; which is not the purview of this study.
Accountability theory	Identifiability	√	People tend to behave differently when they know their work will be linked to them. Identifiability will be studied because it increases one's engagement in sustainability actions.
	Expectation of evaluation	√	When people expect to be evaluated, they tend to perform better. Evaluation will be studied because it increases one's engagement in sustainability actions.
	Awareness of monitoring	√	Awareness of monitoring also increases a person's engagement in sustainability actions. Therefore, it will be investigated to test for the strength of its effect.
	Social Presence	×	Social presence used in the accountability theory is similar to the societal structure of the BAO which has been already adopted.
	Perceived accountability	×	Perceived accountability is not adapted because the scope of the study is to measure sustainability actions that lead to Green ICT and not only accountability.

	Intention	×	The study is more interested in measuring actual engagement in sustainability actions and not just intention to engage. Therefore, intention will not be adapted.

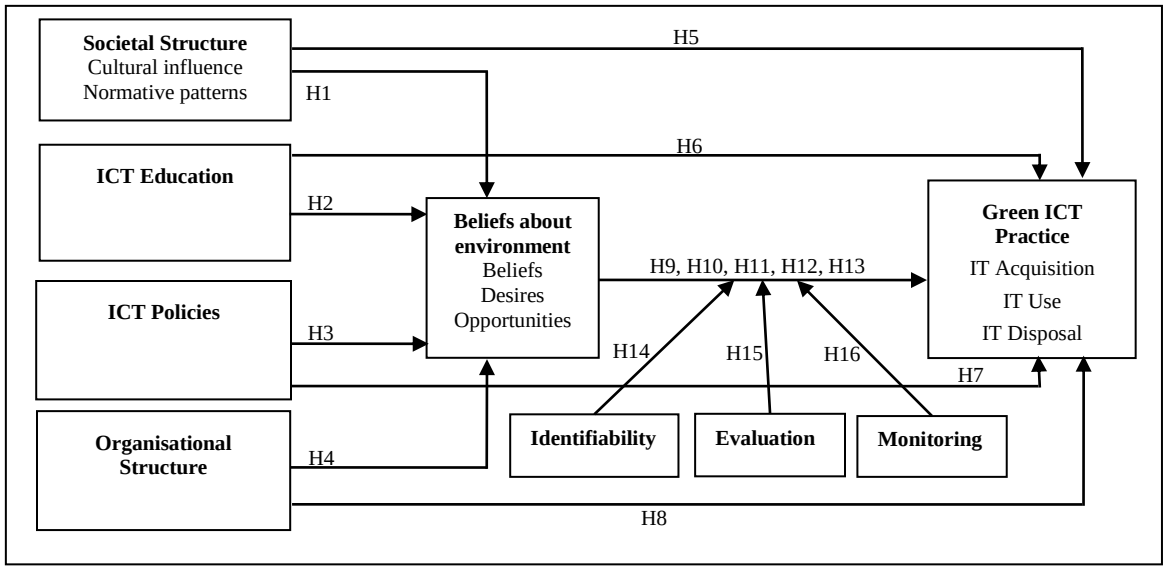
√ means a variable has been adopted while × means not adopted

Some constructs of BAO model and accountability theory will be adopted in this study to collect data and thereafter present the findings in accordance with them.

2.7.3 Conceptual Framework

A conceptual framework is a tool that enables the presentation of ideas and principles from relevant fields in a structured manner (Smyth, 2004). They are used at the start of the research as a guide and enable a researcher make a more clear meaning out of the results. They enable one to delineate the input and output and list variables of the study. Because the study combined constructs of two theories, it was necessary to develop a conceptual framework to combine these constructs into one structure. Subsequently they help to form the research design, paradigm, link to extant literature and guide the design of data collection tool(s). However, caution must be taken not to limit the results of the study by not limiting the data to be analyzed strictly according to the constructs of the conceptual framework (Smyth, 2004). The conceptual framework is shown in figure 8;

Figure 8: Conceptual Framework



Modified from the BAO model (Melville, 2010) and the Accountability theory (Lerner & Tetlock 1999).

According to the conceptual framework, the independent/predictor variables are the societal structure, ICT education, ICT policies and organisational structure. The beliefs about the environment mediate the relationship between the independent variables and Green ICT. According to Baron and Kenny (1986, p.1176), mediator variables account for the relationship between the predictor and criterion variables. They detail how or why such effects occur (p.1176). Analysis of the mediator variables was done to examine relationship between predictor and mediator variables, relationship between mediator and criterion variables and relationship between predictor and criterion variables. The study also investigated identifiability, evaluation and monitoring as moderator variables. According to Baron and Kenny (1986, p.1174), moderator variables affect the direction or the strength of the relationship between the predictor and criterion variables. They explain when certain effects will hold.

Study Variables

Table 4 shows the study variables that were hypothesized in the study

Table 4: Study Variables

No.	Variable	Variable Type
1	Societal Structure	Independent/Predictor variables
2	ICT Education	
3	ICT Policies	
4	Organisational Structure	
5	Beliefs about the environment	Mediating variable
6	Identifiability	Moderating variables
7	Evaluation	
8	Monitoring	
9	Green ICT practice	Dependent/Outcome variable

Societal structure was measured according to cultural influence such as media exposure, community environmental programs, community environmental resources among others. Additionally, normative patterns were measured, and these were mainly the influence of family and other influential persons such as political and religious leaders on a person's understanding of the environment and thereby the need to sustain it (Coleman, 1986, 1994; Gholami et al., 2013; Melville, 2010; Mithas et al., 2010; Molla et al., 2014). The study measured how cultural factors affect an individual's belief about the environment. The study also measured how normative patterns affect an individual's belief about the environment.

ICT education was measured according to whether an individual was taught about the positive and negative impacts of ICT on the environment and how ICT can be used for environmental sustainability (Adu et al., 2014; Wabobwa et al., 2013; Wabobwa et al.,

2012; Wang et al., 2013). The study measured how ICT education influences beliefs about the environment.

ICT policies were measured according to how their dissemination to people influence their belief about the environment and Green ICT practice. It also measured whether the respondents have knowledge of the current ICT policies; especially any that are related to environmental sustainability (policies on purchasing, recycling, energy management, disposal etc) (Lee et al., 2013). The study thereafter measured how ICT policies influence beliefs about the environment. Whether the national ICT policies catered for Green ICT was not directly measured in this study.

Organisational structure is how an organisation divides its labour into tasks and coordinates them (Coleman, 1986, 1994; Gholami et al., 2013; Melville, 2010; Mithas et al., 2010; Molla et al., 2014). It measured the values and resources of the organisation which are formed by the expectations of the organisation to save the environment. These were measured according to an organisation's environmental conservation campaigns, environmental management systems and reward systems. This was to find out if individuals in an organisation have strategies for environmental sustainability. Analysis was done to find out if the organisational structure shapes a person's belief about the environment.

Beliefs about the environmental was measured according to a person's beliefs in environmental sustainability, their desires to ensure its sustainability and the opportunities they believe accrue from ensuring environmental sustainability (Coleman, 1986, 1994; Gholami et al., 2013; Melville, 2010; Mithas et al., 2010; Molla et al., 2014). These three constructs measured how the beliefs about the environment persuade a person to engage in Green ICT as a mediating variable. Therefore, beliefs about the environment mediate the relationship between the predictor variables and the criterion variable. The study also measured the direct impact of beliefs about the environment on Green ICT practice.

The strength of the effect of beliefs about the environment on sustainability actions was moderated by a person's awareness that his actions will be linked back to him (identifiability), a person's expectation of his actions being assessed by other people, including his mentors (evaluation) and a person's awareness that his actions are being monitored by other people (monitoring). These moderating effects are adopted from Eargle et al., (2013); Lerner and Tetlock (1999); Vance et al., (2010); Vance et al., (2015) and Vance et al., (2011).

Green ICT was measured by sustainability actions in acquisition, use and disposal of ICT devices. These included actions such as purchase of environmentally friends ICT devices, recycling of paper and ICT equipment, proper disposal/decommissioning of ICT equipment, and energy/power management such as switching off ICT equipment when not in use or using energy efficient ICT equipment (Coleman, 1986, 1994; Gholami et al., 2013; Melville, 2010; Mithas et al., 2010; Molla et al., 2014).

2.8 Research Hypotheses

Basing on the theoretical and conceptual frameworks, the study tested the following hypotheses in table 5;

Table 5: Research Hypotheses

Research objective	**Hypotheses**	
1. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on beliefs about the environment in Uganda.	H1	Societal structure has a positive significant effect on beliefs about the environment.
	H1a	Cultural influence has a positive significant effect on beliefs about the environment.
	H1b	Normative patterns have a positive significant effect on beliefs about the

		environment.
	H2	ICT Education has a positive significant effect on beliefs about the environment.
	H3	ICT policy has a positive significant effect on beliefs about the environment.
	H4	Organisational structure has a positive significant effect on beliefs about the environment.
2. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on Green ICT practice in Uganda.	H5	Societal structure has a positive significant effect on Green ICT practice.
	H6	ICT Education has a positive significant effect on Green ICT practice.
	H7	ICT policy has a positive significant effect on Green ICT practice
	H8	Organisational structure has a positive significant effect on Green ICT practice.
3. To examine the mediating effect of beliefs about the environment on the relationship between societal structure, ICT education, ICT policies, organisational structure and Green ICT in practice in Uganda	H9	Beliefs about the environment positively mediate the relationship between societal structure and Green ICT practice.
	H10	Beliefs about the environment positively mediate the relationship between ICT Education and Green ICT practice.
	H11	Beliefs about the environment positively mediate the relationship between ICT policies and Green ICT practice.
	H12	Beliefs about the environment positively mediate the relationship between organisational structure and Green ICT practice.

4. To establish the effect of beliefs about the environment on Green ICT practice in Uganda.	H13	Beliefs about the environment have a positive significant effect on Green ICT practice.
	H13a	Beliefs have a positive significant effect on Green ICT practice.
	H13b	Desires have a positive significant effect on Green ICT practice.
	H13c	Opportunities have a positive significant effect on Green ICT practice.
5. To assess the moderating effect of identifiability, expectation of evaluation and awareness of monitoring on the relationship between beliefs about the environment and Green ICT practice in Uganda.	H14	Identifiability positively moderates the relationship between beliefs about the environment and Green ICT.
	H15	Expectation of evaluation positively moderates the relationship between beliefs about the environment and Green ICT.
	H16	Awareness of monitoring positively moderates the relationship between beliefs about the environment and Green ICT.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section explains the methods that were used for collecting, analysing and presenting data. Quantitative method was adopted as the research design. Quantitative research is based on positivist and post-positivist paradigms; it uses positivistic methodology (maths proof) and principles. It is a numerical/statistical method and is set by the researcher at the beginning of the research work. However, positivism, when used to study human behaviours has limitations because "no scientific explanation of human behaviour is ever complete" (Berliner, 2002, as cited in Scotland, 2012, p.11). Human behaviour is influenced by a number of factors and variables that may be discovered by the researcher in the course of the study and therefore, impossible to adequately address in any given study. The research therefore, adopted a post-positivist paradigm with a quantitative analytical survey research methodology. Just like it is with positivist paradigm, post-positivist paradigm seeks to collect causal relationships but additionally, participants perspectives are also sought (Scotland, 2012). Both primary and secondary data were used for the study.

3.2 Ontological Perspective

Ontology is defined as "the study of being" (Crotty, 2003, p.10, Gray, 2014, p.19). It has also been defined as a specification of a conceptualization (Gruber, 1995 as cited in Smith, 2004). Hence ontologists still deal with concepts even though in a more abstract way than in linguistics expressions (Smith, 2004). This means that reality is mapped out of the concepts that are developed from our social interactions with entities. For this study we adopted realism ontology. It is the view that objects have an existence independent of the knower (Cohen et al., 2007, p. 7). This means that reality exists regardless of the researcher; it is not mediated by our senses. Therefore, in realism, words used owe their meaning to the things they represent and not how the researcher interprets it.

Realism was adopted because it separates the researcher from the research, thereby reducing bias. It also offers adoption of high standards of rigor and attempts to formulate methods which yield commonly accepted results to be used by policy makers. Due to the novelty of this study in the context of Uganda, realism enabled the researcher find data which are not extant without bias from our own experience. However, positivistic generalisations ignore the intentionality of the individual, thus actions are not fully understood. Additionally, deduction from empirical generalisation is rarely explanatory.

3.3 Epistemological stance

Epistemology is defined as a way of understanding and explaining what is known and how it is known (Crotty, 2003 p.3). Epistemology enables us to study how knowledge is possible and how it came about. In other words it defines the relationship between the knower and what can be known.

The epistemological stance used for the study was objectivism. In this stance, meaning solely resides in objects, not in the conscience of the researcher, and it is the aim of the researcher to obtain this meaning. Therefore, the researcher impartially goes into the world to discover absolute knowledge about a reality. In this epistemological stance, the researcher and the researched are independent entities hence the meaning is with the objects and the researcher merely has to obtain it (Scotland, 2012). Objectivism does not entirely reject subjectivism; it just posits that people's subjectivism can be studied objectively (Gray, 2014).

3.4 Theoretical Perspective

The theoretical perspective is defined as "the theoretical stance informing the methodology and thus providing a context for the process and grounding its logic and criteria" (Crotty, 2003, p.7). Positivist paradigm was selected as the main perspective because it puts forward that ideas can only be incorporated into knowledge if they can be

empirically tested. In this paradigm, reality consists only of what is available to senses and inquiry should only be based upon scientific evidence (Gray, 2014). The main weakness of positivism is that research does not begin merely from observation like is the assumption, but it is theory-laden. However, it was adopted because results are presented as objective truths and it uses probabilities to show that observed findings are correct. Due to the complexity of environmental sustainability, a multi-theoretic and pluralistic approach was selected. The research also adopted assumptions of critical inquiry given the nature of the study. Critical inquiry is a meta-process of investigation; with the assumptions that certain groups in society are more powerful and therefore, influence others and their facts cannot be separated from their ideology and self-interest (Gray, 2014). The critical philosophy helped examine the tensions and struggles among the main players in organisations (organisational structure versus the natural environment). It helped investigate how IS is used to empower individuals' power and silence alternative views.

3.5 Research Approach

The study followed deductive reasoning; this approach begins with hypothesis testing with the aim of confirming, refuting or modifying it (Gray, 2014, p.16). With a deductive approach; events are ordered and interconnected, hence reality is ordered and just deduced. It is guided by a theory and data are collected to confirm or falsify the theory. It uses a theory to develop a working hypothesis, which is then operationalised and tested in order to either accept or reject basing on empirical evidence.

3.6 Methodological assumptions

Methodology is "the strategy, plan of action, process or design lying behind the choice and use of particular methods and linking the choice and use of the methods to the desired outcomes" (Crotty, 2003, p.3). The study adopted an analytical survey methodology with the "attempt to test a theory in the field through exploring the association between variables" (Gray, 2014). The emphases of analytical survey are; one

has to identify the study population, obtain a representative sample, use a deductive approach, control variables and generalise the results of the study.

3.7 Research Timeframe

A cross-sectional study was adopted; because it has the ability to provide a good and yet quick and reliable representation of the findings of the study. Data were collected at one point in time within duration of 6 weeks. When using survey design, the data collected at one point, due to the large size of the sample is generalisable to the population.

3.8 Study Population

Using probabilistic methods, respondents were identified from different institutions and organisations in Uganda that are using ICT in their operations. These comprised of both government and private organizations; including for profit and non-profit making. The unit of observation was individuals because the framework chosen analyses data at both a micro and macro level. The unit of analysis was individuals and therefore, data were collected from more than one respondent per organisation. It was however, difficult to estimate the number of staff in all organisations that use ICT in their operations because almost all organisations use some ICT and worse of all almost all staff in any given organisation use ICT devices.

3.9 Sampling Procedure and Size

Two stage cluster sampling was adopted with respondents clustered according to the nature of organisation (government and private). Thereafter, respondents were randomly selected from each cluster. Given the nature of the study, almost all staff in organisations that use ICT comprised competent respondents because Green ICT requires a consorted and collective effort. Issues of trustworthiness were ensured by gathering data from many participants. A sample size of 384 respondents at a confidence level of 95% and margin

of error of 5.0% was selected (Bartlett, Kotrlik & Higgins, 2001; Krejcie & Morgan, 1970) for the study.

3.10 Data collection method

The main method of data collection used for this study was a self administered survey using a pre-coded questionnaire. This method was selected because it helps elicit quantitative data that is in line with the ontological and epistemological stances adopted. The questionnaire elicited responses about societal structure, ICT education, ICT policies, organisational structure, beliefs about the environment, identifiability, awareness of evaluation, awareness of monitoring, and Green ICT practice.

The questionnaire was first pretested for face validity, content validity and reliability because errors at the sampling design stage can jeopardize the resultant stages in the research design (Cavusgil & Das, 1997, p.218); these errors if detected in time can be corrected. However, poor data collection is harder to resolve due to its involvement with external factors (the respondents).

Face validity was conducted by giving the questionnaire to 8 experts in Green ICT research and quantitative research methods who then indicated their comments highlighting items that needed to be reworded. This enabled the initial corrections on the questionnaire before further developing it for content validity.

Content validity index was also computed; content validity has been defined as “evidence that the content of a test corresponds to the content of the construct it was designed to cover” (Field, 2009, p.783). Content validity index is done in two stages; Item content validity index (I-CVI); which is the content validity of individual items and Scale content validity index (S-CVI); which is the content validity of the overall scale (Lynn, 1989). According to Lynn (1989), content validity can be done by a minimum of 3 experts. Having more than 10 experts is considered unnecessary. For this study, the questionnaire

was given to 6 experts in the field of Green ICT to obtain their opinion. The experts were availed the questionnaires online. The items on the questionnaire were ranked on a 5 point Likert scale ranging from 1= Not Relevant (NR), 2 = Somewhat Relevant (SR), 3 = Quite Relevant (QR), 4 = Relevant (R) and 5 = Very Relevant (VR). Items that were ranked by the experts as 3, 4 and 5 were taken as relevant while those ranked as 1 and 2 were taken as not relevant. Computation of I-CVI was done using Ms Excel by summing up the number of Relevant responses divided by the total number of experts. Thereafter, Scale Content Validity Index average (S-CVI/Ave) was computed by getting the mean I-CVI; summing the I-CVI and dividing by the number of items. The S-CVI/Ave results are shown in Table 6;

Table 6: Results of Content Validity Index

Variable	**No. of items**	**S-CVI/Ave**
Societal structure	8	0.83
ICT Education	8	1.00
ICT Policies	9	0.94
Organisational structure	16	0.83
Beliefs about the environment	25	0.96
Identifiability	8	0.83
Evaluation	8	0.85
Monitoring	8	0.75
Green ICT practice	23	0.90

According to Lynn (1986), the item acceptability for a panel of 5 or less experts is 1.00 while for panels of 6 or more experts, I-CVI of .78 is considered acceptable to allow for flexibility. On the other hand S-CVI/Ave of .80 or more is acceptable (Polit & Beck, 2006). Therefore, according to table 6, S-CVI/Ave for Societal structure (.83), ICT Education (1.00), ICT Policies (.94), Organisational structure (.83), Beliefs about the environment (.96), Identifiability (.83), Evaluation (.85), and Green ICT (.90) practice are acceptable, while that of Monitoring (.75) is not acceptable. Content validity ultimately

enabled the revising, deleting and substituting of some items on the questionnaire before conducting the questionnaire reliability test.

To test for reliability, Cronbach's alpha coefficient was measured to test for internal consistency of how closely related a set of items are as a group (Cronbach, 1951). After revising, deleting and substituting some items on the questionnaire, it was administered to 65 respondents to test for reliability. The results of the reliability test are shown in Table 7;

Table 7: Results of the Reliability test

Variable	**No. of Items**	**Coefficient**
Societal Structure	11	.834
ICT Education	6	.877
ICT Policies	9	.894
Organisational Structure	13	.873
Beliefs about the environment	27	.919
Identifiability	8	.941
Evaluation	8	.943
Monitoring	8	.949
Green ICT Practice	22	.870

Only coefficients above .7 were accepted for the study (Nunnally, 1987). According to the results in table 7, all the variables had coefficients above .83 which shows a good coefficient. Some items were later further eliminated after running an Exploratory Factor Analysis.

3.11 Measurement of variables

The measurement of societal structure, organisational structure and beliefs about the environment was adopted from studies of Melville (2010). The study further introduced ICT education and ICT policies as independent variables. Measurement of ICT education

was guided by studies of Cater-Steel and Tan (2011), Jain et al. (2013) and Mishra et al. (2014). Measurement of ICT policy on the other hand was adopted from studies of Cater-Steel and Tan (2011) and Zhang and Liang (2012). The measurement of the intermediate variable (beliefs about the environment) was adopted from Melville (2010). The measurements of the moderator variables; identifiability, expectation of evaluation and awareness of monitoring was adopted from Lerner and Tetlock (1999) and Vance et al. (2015). Lastly, the measurements for the criterion variable (Green ICT practice) was adopted from studies of Melville (2010), Molla and Cooper (2009) and Cater-Steel and Tan (2011). The responses were measured on a 5 scale likert scale with 1 for strongly disagree, 2 for disagree, 3 for not sure, 4 for agree and 5 for strongly agree.

3.12 Coding and Data analysis

Data Coding is assigning key numbers or values to each response to ease input while data analysis is the process of summarizing the data collected. Data collected were quantitative. The researcher designed codes to ease the entering and analysis of data. Exploratory analysis was done using SPSS 20.0 statistical packages to clean the data before fitting the models. These included descriptive analysis using frequencies to check for wrong data entry, univariate analysis using Z-scores to check for and transform outliers and factor analysis to select the most influencing items for each variable to be used in the model estimation. Diagnostic tests were run to check if the model fits the data well. These included tests for normality, linearity, multicollinearity and homogeneity of variance. Correlations and regressions were estimated to test the relationship between predictor variables, mediation variable, moderator variables and criterion variable in order to make conclusions about the hypotheses. Furthermore, Medgraphs and Modgraphs were also estimated to confirm the hypotheses for the mediation and moderation effects respectively. Structural equation modeling (SEM) using AMOS v.21 was estimated by for mediation and moderation of the study variables. SEM enables complex analysis where there are multiple independent and dependent variables. It is used as a means of validating models by measuring for mediating and moderating effects as well performing analysis of variance (ANOVA) on factors.

3.13 Ethical considerations

Ethics is defined as "the search for rules of conduct that enable us to operate defensibly in the political contexts in which we have to conduct educational research" (Simon, 1995, as cited in Ahmed, 2008). Ethics are necessary in research in order to protect the research participants from psychological, physical and mental harm. The two main ethical positions are utilitarian and deontological positions. This study adopted the utilitarianism position because of its usage of analytical survey methodology which can generalise the findings.

Using an introductory letter from the university institutional review board, I introduced myself to the respondents to seek their permission to participate in the study. The respondents were not coerced to participate in the study. I introduced the type and nature of the study, clearly spelling out how respondents were selected and how the research may impact them. I also ensured that there is no instance where respondents are required to disclose their identity, therefore, anonymity was observed. For privacy reasons, their responses will not be used for reasons beyond academic ones for this study and subsequent publications. Data were collected and analysed using the most appropriate methodology as discussed above. Findings of the respondents were reported without distortion. Care was taken to separate researcher bias stemming from my own experience and knowledge of Green ICT by adopting a realism ontological perspective and objectivism.

3.14 Chapter summary

This chapter presented the methods that were used to conduct this study. Table 8 shows a summary of the analysis used for each research objective and hypothesis.

Table 8: Summary of Analyses conducted

Research objective	**Hypotheses**		**Analysis**
1. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on beliefs about the environment in Uganda.	H1	Societal structure has a positive significant effect on beliefs about the environment.	Regression analysis, SEM
	H1a	Cultural influence has a positive effect on beliefs about the environment.	Regression analysis
	H1b	Normative patterns have a positive effect on beliefs about the environment.	Regression analysis
	H2	ICT education has a positive significant effect on beliefs about the environment.	Regression analysis, SEM
	H3	ICT policy has a positive significant effect on beliefs about the environment.	Regression analysis, SEM
	H4	Organisational structure has a positive significant effect on beliefs about the environment.	Regression analysis, SEM
2. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on Green ICT practice in Uganda.	H5	Societal structure has a positive significant effect on Green ICT practice.	Regression analysis, SEM
	H6	ICT education has a positive significant effect on Green ICT practice.	Regression analysis, SEM
	H7	ICT policies have a positive effect on Green ICT practice	Regression analysis, SEM
	H8	Organisational structure has a positive significant effect on	Regression analysis, SEM

		Green ICT practice.	
3. To examine the mediating effect of beliefs about the environment on the relationship between societal structure, ICT education, ICT policies, organisational structure and Green ICT in practice in Uganda	H9	Beliefs about the environment positively mediate the relationship between societal structure and Green ICT practice.	Regression analysis, Sobel test using Medgraph, SEM, Bootstrapping.
	H10	Beliefs about the environment positively mediate the relationship between ICT Education and Green ICT practice.	Regression analysis, Sobel test using Medgraph, SEM, Bootstrapping.
	H11	Beliefs about the environment positively mediate the relationship between ICT policies and Green ICT practice.	Regression analysis, Sobel test using Medgraph, SEM, Bootstrapping.
	H12	Beliefs about the environment positively mediate the relationship between organisational structure and Green ICT practice.	Regression analysis, Sobel test using Medgraph, SEM, Bootstrapping.
4. To establish the effect of beliefs about the environment on Green ICT practice in Uganda.	H13	Beliefs about the environment have a positive significant effect on Green ICT practice.	Regression analysis, SEM
	H13 a	Beliefs have a positive significant effect on Green ICT practice.	Regression analysis
	H13 b	Desires have a positive significant effect on Green ICT practice.	Regression analysis
	H13 c	Opportunities have a positive significant effect on Green ICT practice.	Regression analysis

5. To assess the moderating effect of identifiability, expectation of evaluation and awareness of monitoring on the relationship between beliefs about the environment and Green ICT practice in Uganda.	H14	Identifiability positively moderates the relationship between beliefs about the environment and Green ICT.	Regression analysis, Modgraph, SEM
	H15	Expectation of evaluation positively moderates the relationship between beliefs about the environment and Green ICT.	Regression analysis, Modgraph, SEM
	H16	Awareness of monitoring positively moderates the relationship between beliefs about the environment and Green ICT.	Regression analysis, Modgraph, SEM

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter presents analysed data to establish the characteristics of the respondents. Measurement of models were analysed using both exploratory factor analysis and confirmatory factor analysis. Further analysis was done to test for correlation and regression of the variables. Medgraphs were plotted to test for mediation and Modgraphs for moderation. The last part of the chapter presents structural equation models and results of bootstrapping for mediation.

4.2 Data cleaning

Data cleaning is an important process in order to avoid affecting the final statistical results. The data was cleaned to ensure consistency and eliminate missing responses. Descriptive analysis was done to check for minimum, maximum and mean data entered per item in order to detect wrong entries. Data entry errors or mistakes resulting from coding were eliminated and/or recoded. Item entries that had wrong responses entered were cross-tabulated and corrected by re-entering the correct response from the corresponding questionnaires which had been numbered during data entry.

Missing responses are unavoidable in survey research (Field, 2009). This is usually caused by the respondents not filling out all responses in the questionnaire due to reasons as them not knowing the response or because the questionnaire is too lengthy or by the data entrant during data entry. In cases where there are many missing responses, it may affect the sample size and ultimately the generalisability of the results. Missing responses were catered to by assigning a neutral value (3). Care was first taken to ensure not more than 10% of the questionnaires had missing values by cross checking the captured data in order not to further reduce the sample size, hinder the application of some statistical procedures, affect the statistical results or affect generalisability of findings (Hair et al.,

2010). Some questionnaires that had most of the questions not answered were totally discarded; this made up 2% of the questionnaires administered.

4.3 Testing for Outliers

Outliers are observation points which are far from the other observations (Field, 2009; Hair et al., 2010). If not corrected, they bias the mean and inflate the standard deviation (Field, 2009, p.97). Outliers are usually expected in large sets of data but they affect the statistical results and not representative of the population. A multivariate analysis was carried out using Z-Scores to check for outliers with a threshold of ±3 since the sample size was more than 80 cases (Hair et al., 2010). It was done in order to improve the results by reducing bias of the mean and reducing the inflation of the standard deviation. Any items that had observations outside ±3 were converted to the nearest observation. Ultimately some items for the variables societal structure, ICT education, beliefs about the environment and Green ICT practice were adjusted to eliminate outliers. All the outliers that were found with low Z values were transformed.

4.4 Diagnostic Tests

It is important to test for statistical assumptions before conducting multivariate analysis to avoid biased and wrong results (Hair et al., 2010). Assumptions of normality, linearity multicollinearity and homogeneity of variance were measured to check if the sample data were drawn from a normally distributed population.

4.4.1 Tests for Normality

Three types of normality tests were done; Skewness and Kurtosis, P-P and Q-Q plots and histograms with a normal curve.

4.4.1.1. Skewness and Kurtosis

Skewness is a measure of symmetry or the lack of symmetry in the data set (Field, 2009). A distribution, or data set, is symmetric if it looks the same to the left and right of the center point. Kurtosis on the other hand is a measure of whether the data are peaked or flat relative to a normal distribution (Field, 2009). Skewness and Kurtosis were measured to check if the data set is normally distributed to be able to defend the choice of analysis and to enable generalisability of findings.

As a general rule of thumb if skewness is less than -1 or greater than 1, the distribution is highly skewed. If skewness is between -1 and -0.5 or between 0.5 and 1, the distribution is moderately skewed. If skewness is between -0.5 and 0.5, the distribution is approximately symmetric while Kurtosis should be between -2 and +2 for normal univariate distribution (George & Mallery, 2010). Appendix 2 shows the results of the skewness and kurtosis measures.

According to the results in appendix 2, societal structure and beliefs about the environment are moderately skewed (-.798 and -.637). All the other variables have approximately symmetric distributions (ICT education -.451, ICT policies -.037, organisational structure .196, identifiability -.149, evaluation -.068, monitoring, .002 and Green ICT practice -.138). Positive values of skewness indicate many low scores on the left and negative values indicate many high scores on the right side of the distribution.

The Kurtosis values for all the variables fell within the range of ±2 also implying normal distribution (societal structure .617, ICT education -.479, ICT policies -.398, organisational structure -.476, beliefs about the environment .314, identifiability -.414, evaluation -.424, monitoring, -.439 and Green ICT practice -.278). According to Field (2009) positive values of kurtosis display many scores on the tail and a pointy distribution (leptokurtic kurtosis) while negative values indicate few scores on the tail and a flat distribution (platykurtic kurtosis).

4.4.1.2 Probability-Probability (P-P) Plots and Quantile-Quantile (Q-Q) plots

P-P plots are used to graphically assess how closely two data sets agree and which plots the two cumulative distribution functions are against each other. It is a graphical way of assessing whether or not a data set is approximately normally distributed (Field, 2009). It plots cumulative probability of a variable against cumulative probability of a normal distribution (Field, 2009). A Q-Q plot on the other hand is a graphical representation of the plots of quantiles of a variable against the quantiles of a normal distribution (Field, 2009). For normally distributed data, the points of both the P-P plot and Q-Q plot should form an approximate straight line along a normal distribution, while deviations from the normal distribution show divergence from the normal distribution (Field, 2009). P-P plots and Q-Q plots were plotted to check for the distribution of data in order to transform them if need be and also to ensure the correct analysis is done and the statistical results are not wrong.

The P-P plots for the variables are in appendix 3 (societal structure - appendix 3a, ICT education – appendix 3b, ICT policies – appendix 3b, organisational structure – appendix 3d, beliefs about the environment – appendix 3e, identifiability – appendix 3f, evaluation – appendix 3g, monitoring – appendix 3h, Green ICT practice – appendix 3i). The results show that the cumulative probabilities of variables were on or close to the normal distribution line for all the variables, revealing fairly distributed data. The P-P plots for ICT policy, organisational structure, monitoring and Green ICT practice have their cumulative probabilities on the normal distribution, meaning they have the most fairly distributed data.

The Q-Q plots for the variables are in appendix 4 (societal structure - appendix 4a, ICT education – appendix 4b, ICT policies – appendix 4c, organisational structure – appendix 4d, beliefs about the environment – appendix 4e, identifiability – appendix 4f, evaluation – appendix 4g, monitoring – appendix 4h, Green ICT practice – appendix 4i). The results

of the Q-Q plots also show that the cumulative quantile variables were on or close to the normal distribution line for all the variables, also showing fairly distributed data. The Q-Q plots for ICT policy, organisational structure, monitoring and Green ICT practice have their cumulative quantiles on the normal Q-Q line, also meaning that they have the most fairly distributed data.

4.4.1.3. Histograms with a normal curve

A histogram shows representation of the distribution of numerical data. It is an estimate of the probability distribution of a quantitative variable. The histogram of fairly distributed data should look like a bell-shaped curve (normal distribution) (Field, 2009). We plotted histograms in order to check if the data are fairly or normally distributed in order to run the appropriate analysis. The histogram was fitted with a normal curve to show the direction of skewness of data from the normal distribution. The histograms for the study variables are shown in appendix 5 labelled as (societal structure - appendix 5a, ICT education – appendix 5b, ICT policies – appendix 5c, organisational structure – appendix 5d, beliefs about the environment – appendix 5e, identifiability – appendix 5f, evaluation – appendix 5g, monitoring – appendix 5h, Green ICT practice – appendix 5i and moderation effect – appendix 5j). According to the histograms, all the variables have fairly distributed data. The histogram for Beliefs about the environment is slightly skewed to the left.

4.4.2 Test for Linearity

Three tests for linearity were done using scatter plots for the variable, linear regression and linear correlation.

4.4.2.1. Linear Scatter plots

Scatter plot matrices are used to roughly determine if there is a linear correlation between multiple variables. It is done by plotting values of one variable against the value of

another variable (Field, 2009). They show the extent to which one variable is affected by another. Scatter plots were plotted in order to pinpoint specific variables that might have similar correlations to other variables. The correlation coefficient (r) greater than 0.1 (or r^2 greater than 0.01) is considered strong while that below is weak (Field, 2009); r= 0.13 or r^2= 0.0169 (zero correlation), r= 0.35 or r^2= 0.123 (weak), r= 0.55 or r^2= 0.303 (moderate positive), r= 0.75 or r^2= 0.562 (strong positive), r= -0.59 or r^2= -0.348 (moderate negative), r= -0.85 or r^2= -0.753 (strong negative).

We first plotted a scatterplot for Green ICT practice and Beliefs about the environment (see appendix 6a). The results show a coefficient of determination r^2 of 0.121 showing a weak correlation between Green ICT practice and Beliefs about the environment. Green ICT practice and societal structure (see appendix 6b) have a coefficient of determination r^2 of 0.160 showing a moderate positive correlation. Green ICT practice and ICT Education (see appendix 6c) have a moderate positive correlation with a coefficient of determination r^2 of 0.206. Green ICT practice and ICT Policy (see appendix 6d) have a coefficient of determination r^2 of 0.110 meaning there is a weak positive correlation. Green ICT practice and organisational structure (see appendix 6e) have a weak positive correlation with a coefficient of determination r^2 of 0.157. Beliefs about the environment and societal structure (see appendix 6f) have a coefficient of determination r^2 of 0.115 also showing a weak positive correlation. Beliefs about the environment and ICT education (see appendix 6g) have a coefficient of determination r^2 of 0.115 also showing a weak positive correlation. Beliefs about the environment and ICT policies (see appendix 6h) have a coefficient of determination r^2 of 0.026 while Beliefs about the environment and organisational structure (see appendix 6i) have a weak positive correlation with a coefficient of determination r^2 of 0.069.

Linearity for standardized predicted values of the dependent variable (ZPRED) and standardized residuals or errors (ZRESID) was assessed. The scatter plot for Green ICT practice which is the dependent variable displays a converging pattern around zero

without any evidence of a curve, hence revealing homogeneity of variance and linear relationship between the dependent variable and independent variables (see appendix 6j).

4.4.2.2 Correlations

Correlation is a statistical technique used to measure and describe the direction and strength of the relationship between two variables (Field, 2009). It measures the extent to which a change in one variable affects another variable. Bivariate correlation was run to look for relationship between variables without controlling other additional variables. Because we have interval data with a normal distribution, Pearson correlation was used. Bivariate correlation was done in order to check if the variables are related.

The results in Appendix 8 shows that societal structure is positively correlated to ICT education, with a coefficient of $r = .43$, which is significant at $p < .001$. Societal structure is positively correlated to ICT policy, with a coefficient of $r = .28$. Societal structure is positively correlated to organisational structure, with a coefficient of $r = .25$. Societal structure is also positively correlated to beliefs about the environment, with a coefficient of $r = .34$. Societal structure is positively correlated to Green ICT practice, with a coefficient of $r = .40$. Additionally, ICT education is positively correlated to ICT policies, with a coefficient of $r = .31$. ICT education is positively correlated to organisational structure, with a coefficient of $r = .33$. ICT education is positively correlated to beliefs about the environment, with a coefficient of $r = .34$. ICT education is positively correlated to Green ICT practice, with a coefficient of $r = .45$, (all with $p < .001$).

ICT policy is positively correlated to organisational structure, with a coefficient of $r = .49$. ICT policy is also positively correlated to beliefs about the environment, with a coefficient of $r = .16$. ICT policy is positively correlated to Green ICT practice, with a coefficient of $r = .33$. Organisational structure is positively correlated to beliefs about the environment, with a coefficient of $r = .26$. Organisational structure is positively correlated to Green ICT practice, with a coefficient of $r = .39$. Finally, beliefs about the

environment is positively correlated to Green ICT practice, with a coefficient of r = .35, (all with p < .001). All the relationships between the variables are of medium effect (Field, 2009). The results also indicate that the chances of the null hypotheses being supported are close to zero.

4.4.2.3 Linear Regression Estimation

Multiple regression is a linear model in which one variable or outcome is predicted from many predictor variables (Field, 2009, p.793). It is an approach for modelling the relationship between a scalar outcome (dependent) variable and more than one predictor (independent) variable. Equation 1 shows the linear regression model.

Equation 1: Linear Regression Model

$$Y_i = b_0 + b_1X_{i1} + b_2X_{i2}.....+ b_nX_{in} + \varepsilon_i$$

Where Y is the outcome variable, X is the predictor, b_1 is the regression coefficient associated with the first predictor (X_1), b_2 is the coefficient of the second predictor (X_2), b_n is the coefficient of the nth predictor (X_n), and b_0 is the value of the outcome when the predictor is zero.

Linear regression was estimated to describe the relationship between the predictors and outcome variables and to establish if the model is significant to predict variability in beliefs about the environment and Green ICT.

The first linear regression analysis was to model the relationship between Beliefs about the environment (outcome variable) and societal structure, ICT education, ICT policies and organisational structure (predictor variables). This results show that societal structure, ICT education, ICT policies and organisational structure account for 18.1% of the variability in beliefs about the environment (see appendix 8a). The model is useful for predicting beliefs about the environment with F-ratio (F) of 19.73 which is significant at p<0.001 (significance is .000) (see appendix 8b). Societal structure positively changes

beliefs about the environment by 22.8%; this is very significant at p<.001 (significance is .000) (see appendix 8c). ICT education positively changes beliefs about the environment by 14.4%; this is very significant at p<.001 (significance is .000) (see appendix 8c). Organisational structure positively changes beliefs about the environment by 10.1%; this is very significant at p<.05 (significance is .004) (see appendix 8c). However, ICT policy negatively changes beliefs about the environment by 3.4%; but is not significant at p<.05 (significance is .416) (see appendix 8c).

Beliefs about the environment mediate the relationship between green ICT practice and the predictor variables. Therefore, analysis was also done to model the relationship between Green ICT practice (outcome variable) and societal structure, ICT education, ICT policies, organisational structure and beliefs about the environment (predictor variables). These results show that societal structure, ICT education, ICT policies, organisational structure and beliefs about the environment account for 33.5% of the variation in Green ICT practice (see appendix 8d). The model is also useful for predicting Green ICT with F-ratio (F) of 35.81 which is significant at p<0.001 (significance is .000) (see appendix 8e). A change in societal structure increases Green ICT practice by 20.8%; which is very significant at p<.001 (significance is .000) (see appendix 8f). For every increase in ICT education, Green ICT practice increases by 19.6%; this is very significant at p<.001 (significance is .000) (see appendix 8f). A change in organisational structure increases Green ICT practice by 13.9%; which is very significant at p<.001 (significance is .000) (see appendix 8f). For every positive change in beliefs about the environment, Green ICT practice increases by 16.4%; this is significant at p<.05 (significance is .003) (see appendix 8f). A change in ICT policy increases Green ICT practice by 7.7%; but is not significant at p<.05 (significance is .077) (see appendix 8f). Despite the seemingly low R^2, the residual plots and other assumptions look good and the p-values and regression coefficients are significant except for ICT policies. Also since the regressions were done to analyse the relationship between predictors and outcome variables, the R^2 is almost irrelevant. The results show that ICT policy is not a significant predictor of both beliefs about the environment and green ICT practice.

4.4.3 Test for Multicollinearity

Multicollinearity or collinearity is when there is a strong correlation between two or more predictors in a regression model making it possible to linearly predict one variable from the others with a substantial degree of accuracy (Field, 2009, p.223). Multicollinearity is a common problem when estimating regressions. Perfect collinearity poses problems of having values of two variables being interchangeable, thereby affecting the R and having untrustworthy regression coefficients and making it difficult to measure the importance of individual predictors (Field, 2009). Having correlation (r) of ±1 between two variables is an indication of perfect collinearity. The initial findings from the correlation indicate there is no perfect collinearity.

Multicollinearity was analysed to ensure that collinearity does not pose a problem for multiple regression to test the hypotheses. Variance inflation factor (VIF) was used to measure how much the variance of the estimated regression coefficients are inflated as compared to when the predictor variables are not linearly related. According to Field (2009, p. 224) "the VIF indicates whether a predictor has a strong linear relationship with the other predictor(s)". The threshold for VIF is 10; therefore, VIF above 10 should cause concern of collinearity (Myers, 1990, as cited in Field, 2009). Tolerance which is a reciprocal of VIF (1/VIF) should therefore, not go below 0.1. Results from appendix 7f show the VIF and Tolerance respectively for societal structure is 1.33 and .754, ICT education is 1.38 and .725, ICT policies is 1.39 and .720, organisational structure is 1.41 and .708, and beliefs about the environment is 1.22 and .819. Therefore, VIF for all the predictor variables are below 10 and Tolerance is above 0.1. Additionally, the average VIF for all the variables is 1.35 which is not significantly more than 1 meaning there is no cause for concern on collinearity; the variables are therefore, not strongly correlated. Appendix 9 shows slight collinearity between societal structure and beliefs about the environment on the dimension with the smallest Eigen value. However, their correlation is below .90 ($r=.34$, $p<0.001$) (see appendix 8) so the problem is not significant (Field, 2009). All the variables were subsequently left for further analysis.

4.4.4 Test for Homogeneity of Variance

Homogeneity and heterogeneity arise in describing the properties of a dataset. A homogeneous dataset is one where the variables are one type (either binary or categorical), while a heterogeneous dataset is where the dataset is mixed (both binary and categorical). The assumption of homogeneity of variance is that the variance within each of the populations is equal. "This assumption means that as you go through levels of one variable, the variance of the other should not change" (Field, 2009, p.149). Homogeneity of variance for correlational analysis is done using graphs while for groups of data is tested using Levene test (F). "Levene's test tests the null hypothesis that 'the variances in different groups are equal' (i.e. the difference between the variances is zero)" (Field, 2009, p.150) by doing a one-way ANOVA. The interpretation is that if the Levene's test is significant at $p \leq .05$, the null hypothesis is incorrect, meaning the variances are significantly different and homogeneity of variance assumption has been violated and vice versa (Field, 2009).

Homogeneity of variance was estimated in order to establish the validity of the assumption that the statistical properties of any one part of the overall dataset are the same as any other part. According to the analysis, the scatter plot (see appendix 10a) has converged towards the right showing that the dataset is homogeneous and the data are from the same population. For the percentage (see appendix 10b) on the societal structure, the variances were significantly different in the dataset, $F(1, 360) = 5.76$, p.<.05 meaning that homogeneity of variance assumption has been violated. For the rest of the variables, the variances were equal (ICT education $F(1,360) = 2.13$, ICT policies $F(1,360) = .29$, organisational structure $F(1,360) = .51$, beliefs about the environment $F(1,360) = .02$, identifiability $F(1,360) = .27$, evaluation $F(1,360) = .16$, monitoring $F(1,360) = .002$ and Green ICT practice $F(1,360) = 1.04$). This means that homogeneity of variance has not been violated.

4.5 Sample Characteristics

Both the unit of inquiry and unit of analysis were individuals; respondents who use ICT in any form at their places of work. Table 9 presents the characteristics of respondents.

Table 9: Respondent characteristics

Characteristic	**Group**	**Freq**	**%**
Gender	Male	209	58
	Female	153	42
	Total	362	100
Age group	<20	2	1
	20-30	186	51
	31-40	152	42
	41-50	19	5
	>50	3	1
	Total	362	100
Education level	Diploma	30	8
	Bachelors Degree	171	47
	Postgraduate Diploma	24	7
	Masters Degree	129	36
	PhD	3	1
	Other	5	1
	Total	362	100
Type of organisation	Public	125	35
	For Profit Private	170	47
	Not for Profit Private	66	18
	Other	1	0
	Total	362	100
ICT use	Yes	357	99
	No	5	1
	Total	362	100
Type of device	Phone	325	90
	Desktop computer	270	75
	Laptop	145	40
	Tablet	84	23
	Other	18	5
Knowledge of non biodegrability	Yes	220	61
	No	142	39

	Total	362	100
Knowledge of toxic chemicals	Yes	225	62
	No	137	38
	Total	362	100
Knowledge about Green ICT	Yes	101	28
	No	261	72
	Total	362	100

Results in Table 9 show that most of the respondents were male (52%) compared to females who were 42%. For the age groups, below 20 years were 1%, 20-30 years were 51%, 31-40 years were 42%, 41-50 years were 5% while above 50 years were 1%. The results reveal that most of the respondents were 20-30years and 31-40 years which is reflective of the age distribution in the Uganda. In terms of education level, most of the respondents were Bachelor degree holders (47%), followed by Masters degree (36%). The other respondents were Diploma holders (8%), postgraduate Diploma (7%), PhD and other (such as professional courses) were both 1%. Most of the workforce in Uganda follows that pattern, showing representativeness of the sample. Additionally, for the type of organisation in which the respondents were working, the data reveals that most of them work in for profit private companies (47%), others were in public/government organisations (35%), not for profit private organisations like NGOs were 18%.

The respondents were asked if they are already using any ICT devices and 99% of them said yes while only 1% said no. However, a look at the questionnaires were the respondents said no, they went ahead to select some of the devices they are using, meaning that this item response has some response error. The question item on the type(s) of devices used by the respondents, 90% indicated they use a phone, 75% use desktop computers, 40% use laptops, 23% use tablets while 5% indicated other (for example printers, photocopiers among others). This question was bivariate so the respondents could select more than one device. Asked if the respondent was aware that computing devices are not biodegradable, 61% said they are aware while only 39% were not. We also asked if the respondent is aware that toxic chemicals are used in the manufacture of computing devices and 62% indicated yes while 38% said no. We finally

asked the respondents if they know about Green ICT and only 28% said yes while most of them (72%) are not aware.

4.6 Validation of measures

Validation of measurement scales was tested using exploratory factor analysis and confirmatory factor analysis. Exploratory Factor Analysis (EFA) is an exploratory tool in which the values of observed data are expressed as functions of a number of possible causes in order to find which are the most important. EFA was done in order to reduce the dataset while finding the most important factors among the list of factors on the questionnaire. This enabled the elimination of less important factors in the final analysis of data to remain with the most important ones. Components were checked to make sure those with Communalities less than 0.4 are removed. Kaiser-Meyer-Olkin (KMO) was used to verify the sampling adequacy for factor analysis. The variable should have KMO >.05; values less than that would lead to recollection of data or changing of the research questions. Values between 0.5 and 0.7 are mediocre, values between 0.7 and 0.8 are good, values between 0.8 and 0.9 are great and values above 0.9 are superb (Hutcheson & Sofroniou, 1999). Bartlett's test of sphericity should be significant (less than .05), Keiser's criteria of Eigenvalue should be greater than 1 for samples greater than 250, average communality should be greater than 0.6, Correlation Matrix Determinant more than .00 (Field, 2009).

Confirmatory Factor analysis is used to confirm validity of measurement scales before structural equation modeling (Hair et al., 2010). The proposed model for the study is fairly complex having variables with multiple relationships and mediating and moderating variables. This type of model having constructs with many indicators or manifest variables can be best analysed using SEM (Chin 1998; Hair, Ringle & Sarstedt 2011). CFA was done in two levels; with the first one run to test the relationship between the factors (unobserved variables) and the observed measures (items) for each of the nine latent variables. The second-order CFA model tested the relationship between each of the latent variables and its factors or subscales. Subsequently, convergent validity was

determined using Average variable extracted (AVE) with a threshold value of .5 and a comparison between AVE and the square of correlation between two constructs (R^2) was used to test for discriminant validity. Because the data are normally distributed Covariance based SEM (CB- SEM) was used. AMOS (Analysis of Moments of Structures) version 21.0.0 was used to run the proposed conceptual model.

To accept a model, the chi-square (CMIN/χ^2) should not be significant. However, if the sample size exceeds 200 and there are many variables like it is in this study, the model may be accepted with a chi-square which is significant. The relative (normed) chi-square (χ^2/df); which is the value of the chi-square index divided by the degree of freedom (DF) should be less than 2 (Ullman, 2001) or less than 5 (Schumacker & Lomax, 2004). The Goodness of Fit index (GFI) should exceed .9 (Byrne, 1994), the Root Mean Square Error of Approximation (RMSEA) should be less than .08 (Browne & Cudeck, 1993) though Stieger (1990) put it at not exceeding .5. The Comparative fit index (CFI) should approach 1, Incremental fit index (IFI) should exceed .9, Normed fit index (NFI) should be close to 1 and Relative fit indices (RFI) should be above .95 to indicate acceptable fit (Byrne, 1994). For Tucker Lewis Index (TFI), values over .90 or over .95 are considered acceptable (Hu & Bentler, 1999).

4.6.1 Societal structure

4.6.1.1 EFA

Societal structure consisted of 11 items measured using 2 constructs. Components were checked and items with communality less than .5 were removed; 4 items were removed. Further iterations revealed that two items that were under cultural influence fitted in normative patterns, therefore, they were also removed leaving 5 items. According to Table 10 KMO = .81 which is a great level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square= 613.894, DF=21, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .180 which shows that there is no multicollinearity or singularity between

variables since it is greater than .00. Principle Component Analysis (PCA) extracted both the two factors of societal structure with Eigenvalues >1. The eigenvalue for Normative pattern is 2.73 while that of cultural influence is 1.32 which are both above 1. The rotated factor loadings for the items ranged between .50 and .89 with average communality of .61. The percentage variance explained by the two factors is 39.04 for normative patterns and 18.79 for cultural influence altogether giving 58% of the variance in societal structure.

Table 10: EFA results for societal structure

Rotated Component Matrix[a]

	Component	
	Normative Patterns Factor Loading	Cultural Influence Factor Loading
Some of the political leaders I know engage in conserving the environment.	.803	
Some of my religious members engage in conserving the environment.	.711	
Some of the organisations in my community engage in conserving the environment.	.710	
I have had media exposure to environmental issues (e.g. through newspapers, documentaries, movies, radio etc).		.894
My status in my community requires me to participate in environmental conservation.		.504
Eigen Value	2.733	1.316
% of Variance	39.038	18.793
Cumulative %	39.038	57.831
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.812	
Bartlett's Test of Sphericity Approx. Chi-Square	613.894	
Bartlett's Test of Sphericity Df	21	
Bartlett's Test of Sphericity Sig	.000	
Determinant	.180	
Average communalities	.6076	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 3 iterations.

4.6.1.2 CFA

Components of societal structure (SS) were confirmed using CFA. Two factors of societal structure were confirmed namely cultural influence (CI) and normative patterns (NP). Further, CFA confirmed two measures for cultural influence and two measures for

normative patterns. The model fit estimates for each factor are presented in Table 11. The results reveal that the individual factor models (cultural influence and normative patterns) fit the observed data well and hence are good representatives of societal structure. Therefore, both factors were included in the CFA model for societal structure.

Figure 9 presents the CFA measurement model for societal structure (SS) showing the relationship between the two factors CI and NP and observed variables. The results in Table 11 show that the model generated a chi-square value (CMIN/χ^2) of 5.29 and χ^2/df of 5.298 which is more than 5, with 1 degree of freedom at P=.021 which is less than 0.5 and the RMSEA is .11 which is more than .08 hence suggesting a poor model fit. However, other goodness of fit measures indicate a good model fit. GFI is .993, AGFI is .928, NFI is .98, RFI is .881, IFI is .984, TLI is .901 and CFI is .983. This shows that the model is fit because GFI, IFI, TLI are all >.9, only RFI is less than .9 while NFI and CFI are both close to 1. Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the factors and observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between societal structure components and the observed variables. The two factors of societal structure correlate with most of them having correlations above .65 except one which is .31 which indicate large correlation effects. This means the dimensions of societal structure co-vary with each other.

The established model AVE is .51 which is above .5 while the discriminant validity (squared correlations) is .48 which is less than the AVE. The AVE and discriminant validity confirm that the two constructs of societal structure are convergent and discriminant. Construct validity of the societal structure measurement scale is therefore, confirmed with two dimensions and four items measures. As a result, there is no significant difference between the hypothesized and observed factors of societal structure on the mediating relationship between beliefs about the environment and Green ICT practice in Uganda.

Figure 9: A Two Factor CFA for Societal Structure with observed variables

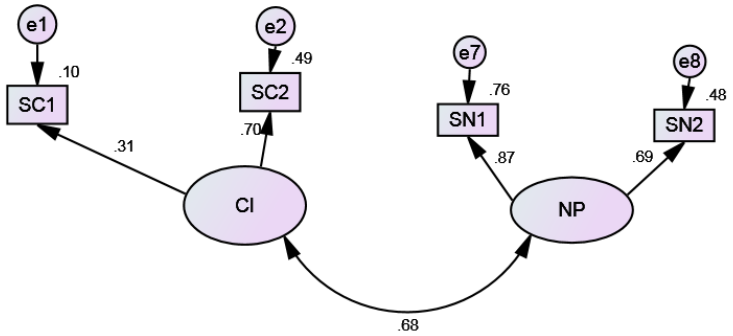


Table 11: CFA Model Estimates for Societal structure

			B	S.E.	C.R.	β	P	AVE	Squared correlation
SC1	<---	CI	1.000			.312		.51	.467
SC2	<---	CI	3.041	.837	3.631	.699	***		
SN1	<---	NP	1.000			.874			
SN2	<---	NP	.702	.089	7.922	.694	***		

Model	χ^2	χ^2/df	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
SS	5.298	5.298	.021	.993	.928	.980	.881	.984	.901	.983	.11

Source: **Primary data**

4.6.2 ICT education

4.6.2.1 EFA

ICT education consisted of 6 items measured using 1 point anchor. Components were checked for communalities less than .5 and none of the items were removed. According to Table 12 KMO = .82 which is a great level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square= 1049.686, DF=15, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .053 which shows that there is no multicollinearity or singularity between variables since it is greater than .00. Principle Component Analysis (PCA) extracted have Eigenvalues >1 (eigenvalue extracted is 3.56). The factor loadings for the items ranged between .53 and .88 with average communality of .60. The percentage variance explained is 59.39 meaning that the items explain 59% of the variance in ICT education.

Table 12: EFA results for ICT education

Component Matrix[a]

	Component
	ICT Education Factor Loadings
I was made aware of the positive and negative impacts of the ongoing use of ICT e.g. the energy used and saved due to the use of ICT.	.879
I was made aware of the positive and negative impacts of ICT on the environment created by the physical existence of the ICT and the manufacturing process.	.847
I was made aware of the positive and negative impacts arising from many people using ICT over a period of time e.g. reduced movements.	.799
I was made aware of how ICT can be used to conserve the environment.	.794
I was made aware of the concept of Green ICT during my ICT classes.	.721
I have received some formal ICT education as a course, course unit/module or training.	.532
Eigen Value	3.562
% of Variance	59.368
Cumulative %	59.368
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.836
Approx. Chi-Square	1049.686
Bartlett's Test of Sphericity Df	15
Sig	.000
Determinant	.053
Average communality	.60

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

4.6.2.2 CFA

Components of ICT education (ICTEd) were confirmed using CFA. CFA confirmed four measures for the variable. The model fit estimates for each factor are presented in Table 13. The results reveal that the individual factor model fits the observed data well and hence is good representative of ICT education.

Figure 10 reveals the CFA measurement model for ICT Education. The results in Table 13 show that the model generated a chi-square value (CMIN/χ^2) of 7.65, with 2 degrees of freedom at P=.022 which is less than 0.5 and the RMSEA is .08 hence suggesting a poor model fit. However, other goodness of fit indices reveals a good model fit. χ^2/df is 3.824 which is less than 5, GFI is .99, AGFI is .949, NFI is .989, RFI is .966, IFI is .992,

TLI is .975 and CFI is .992. This shows that the model is fit because GFI, IFI, RFI, TLI are all >.9 while NFI and CFI are both close to 1.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between the observed variables of ICT education. The observed variables of ICT education correlate with most of them having correlations above .72 except one which is .38 which all indicate large correlation effects. This means the dimensions of ICT education co-vary with each other.

The established model AVE is .57 which is also above .5 indicating convergence and hence confirmation of the construct validity of the ICT education measurement scale with four items measures. Therefore, there is no significant difference between the hypothesized and observed factors of ICT education on the mediating relationship between beliefs about the environment and Green ICT practice in Uganda.

Figure 10: A one Factor CFA for ICT Education with observed variables

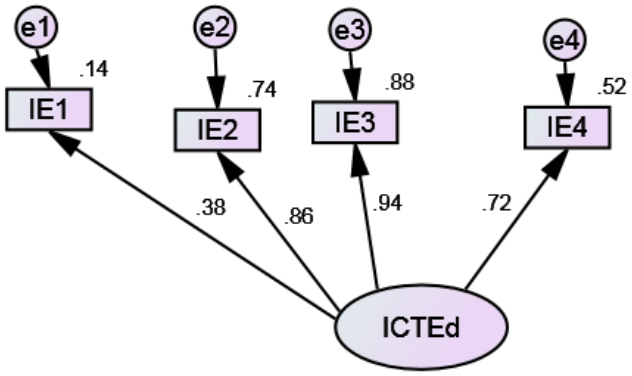


Table 13: CFA Model Estimates for ICT Education

			B	S.E.	C.R.	β	P	AVE
IE1	<---	ICTEd	1.000			.375		.571

			B	S.E.	C.R.	β	P	AVE
IE2	<---	ICTEd	2.958	.414	7.144	.860	***	
IE3	<---	ICTEd	3.195	.445	7.186	.939	***	
IE4	<---	ICTEd	2.256	.329	6.866	.724	***	

Model	χ^2	χ^2/df	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
ICTE	7.649	3.824	0.22	.990	.949	.989	.966	.992	.975	.992	.08

Source: Primary data

4.6.3 ICT policies

4.6.3.1 EFA

ICT policies consisted of 8 items measured using 1 point anchor. Components were checked for communalities less than .5 and 5 of the items were removed leaving 3 items. According to Table 14 KMO = .56 which is a mediocre level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square = 416.768, DF=3, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .313 which shows that there is no multicollinearity or singularity between variables since it is greater than .00. Principle Component Analysis (PCA) extracted have Eigenvalues >1 (eigenvalue extracted is 1.985). The factor loadings for the items ranged between .55 and .92 with average communality of .66. The percentage variance explained is 66.56 meaning that the items explain 67% of the variance in ICT policies.

Table 14: EFA results for ICT policies

Component Matrix[a]

	Component
	ICT Policies Factor loadings
The national ICT policies guide how I should dispose of ICT hardware such as laptops, mobile phone sets, toner cartridges, etc in consideration of the environment.	.918
The national ICT policies guide how I can recycle ICT hardware (e.g. adopting it to another use) in consideration of the environment.	.917
I have access to the national ICT policies of Uganda.	.549
Eigen value	1.985
% of Variance	66.157
Cumulative %	66.157
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.562

Bartlett's Test of Sphericity	Approx. Chi-Square	416.768
	Df	3
	Sig	.000
Determinant		.313
Average communality		.662

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

4.6.3.2 CFA

CFA was used to confirm components of ICT policy (ICTP). CFA confirmed five measures for the variable. The model fit estimates for each factor are presented in Table 15. The results reveal that the individual factor model fits the observed data well and hence is good representative of ICT policy.

Figure 11 shows the CFA measurement model for ICT Policies. The results in Table 15 show that the model generated a RMSEA of .11 hence suggesting a poor model fit. Chi-square value (CMIN/χ^2) is 25.21 and χ^2/df of 5.042 which is more than 5, with 5 degrees of freedom at P=.022 which is less than 0.5. This means the chi-square of the model is significant, hence indicating a poor model fit. Other goodness of fit indices confirm a good model fit; GFI is .973, AGFI is .92, NFI is .973, RFI is .947, IFI is .978, TLI is .957 and CFI is .978. This shows that the model is fit because GFI, IFI, RFI, TLI are all >.9 while NFI and CFI are both close to 1.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between the observed variables of ICT policies. The observed variables of ICT policies correlate with most of them having correlations above .72 which indicates large correlation effects except one which is .26 which is a medium correlation effect. This means the dimensions of ICT education co-vary with each other.

The established model AVE is .56 which is also above .5 indicating convergence and hence confirmation of the construct validity of the ICT policies measurement scale with five items measures. Therefore, there is no significant difference between the hypothesized and observed factors of ICT policies on the mediating relationship between beliefs about the environment and Green ICT practice in Uganda.

Figure 11: A one Factor CFA for ICT Policies with observed variables

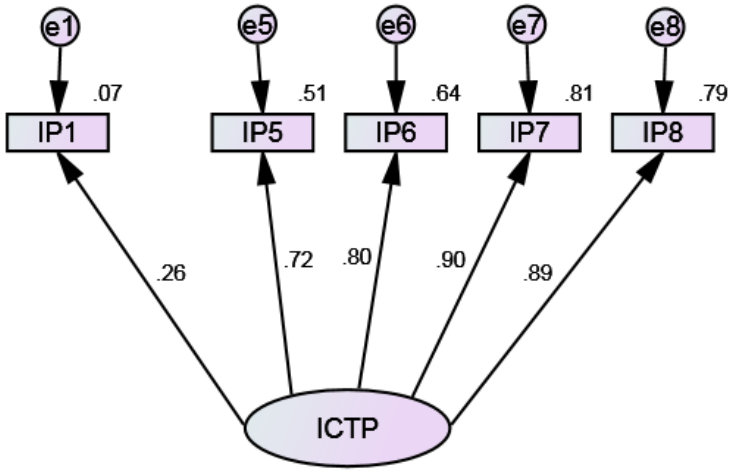


Table 15: CFA Model Estimates for ICT Policies

			B	S.E.	C.R.	β	P	AVE
IP1	<---	ICTP	1.000			.258		.56
IP8	<---	ICTP	2.742	.571	4.802	.886	***	
IP5	<---	ICTP	2.102	.448	4.696	.716	***	
IP6	<---	ICTP	2.427	.510	4.757	.800	***	
IP7	<---	ICTP	2.575	.536	4.807	.900	***	

Model	**χ^2**	**χ^2/df**	**P**	**GFI**	**AGFI**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**
ICTP	25.209	5.042	.000	.973	.920	.973	.947	.978	.957	.978	.11

Source: Primary data

4.6.4. Organisational structure

4.6.4.1. EFA

Organisational structure consisted of 13 items measured using 1 point anchor. Components were checked for communalities less than .5 and 10 of the items were

removed leaving 3 items. According to Table 16 KMO = .59 which is a mediocre level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square =337.085, DF=3, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .391 which shows that there is no multicollinearity or singularity between variables since it is greater than .00. Principle Component Analysis (PCA) extracted have Eigenvalues >1 (eigenvalue extracted is 1.978). The factor loadings for the items ranged between .62 and .89 with average communality of .66. The percentage variance explained is 65.95 meaning that the items explain 66% of the variance in organisational structure.

Table 16: EFA results for organisational structure

Component Matrix[a]

	Component
	Organisational Structure
My organisation has a policy that guides recycling of ICT hardware in consideration of the environment.	.894
My organisation has a policy that guides disposal of ICT hardware in consideration of the environment.	.890
My organisation encourages telecommuting (working from home to reduce travelling).	.622
Eigen Value	1.978
% of Variance	65.949
Cumulative %	65.949
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.592
Approx. Chi-Square	337.085
Bartlett's Test of Sphericity Df	3
Sig	.000
Determinant	.391
Average communality	.659

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

4.6.4.2 CFA

Components of organisational structure (OS) were confirmed using CFA. CFA confirmed five measures for the variable. The model fit estimates for each factor are presented in Table 17. The results reveal that the individual factor model fits the observed data well and hence is good representative of organisational structure.

Figure 12 shows the CFA measurement model for Organisational Structure. The results in Table 17 show that the model generated a chi-square value (CMIN/χ^2) of 36.311 and χ^2/df of 7.262 which is more than 5, with 5 degrees of freedom at P=.000 also less than 0.5 and the RMSEA is .13 hence suggesting a poor model fit. However, other goodness of fit indices reveals a good model fit. GFI is .959, AGFI is .878, NFI is .952, RFI is .905, IFI is .959, TLI is .917 and CFI is .958. This shows that the model is fit because GFI, IFI, RFI, TLI are all >.9 while NFI and CFI are both close to 1.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between the observed variables of organisational structure. The observed variables of organisational structure correlate with most of them having correlation coefficients above .37 which indicate large correlation effects. One correlation coefficient is .26 which shows a moderate effect. This means the dimensions of organisational structure co-vary with each other.

The established model AVE is .52 which is also above .5 indicating convergence and hence confirmation of the construct validity of the organisational structure measurement scale with five items measures. Therefore, there is no significant difference between the hypothesized and observed factors of organisational structure on the mediating relationship between beliefs about the environment and Green ICT practice in Uganda.

Figure 12: A one Factor CFA for Organisational structure with observed variables

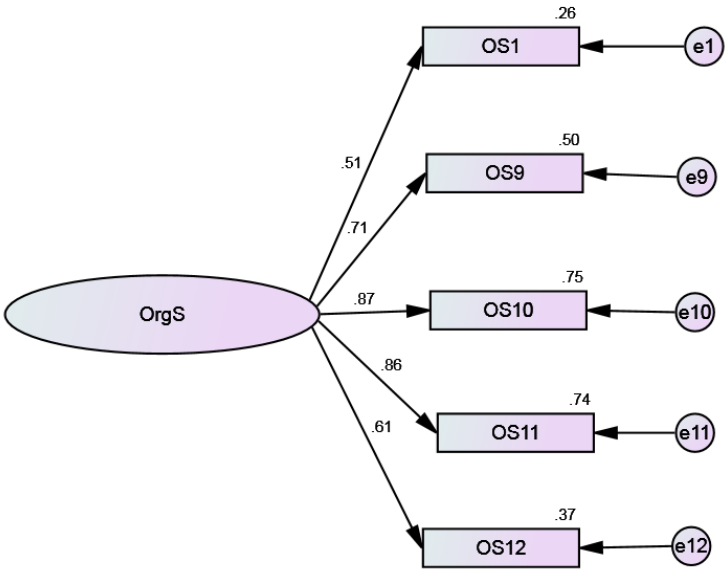


Table 17: CFA Model Estimates for Organisational Structure

			B	S.E.	C.R.	β	P	AVE
OS1	<---	OrgS	1.000			.507		.523
OS9	<---	OrgS	1.555	.173	8.993	.707	***	
OS10	<---	OrgS	1.716	.175	9.782	.866	***	
OS11	<---	OrgS	1.762	.180	9.766	.861	***	
OS12	<---	OrgS	1.257	.152	8.286	.608	***	

Model	χ^2	χ^2/df	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
OS	36.311	7.262	.000	.959	.878	.952	.905	.959	.917	.958	.13

Source: Primary data

4.6.5 Beliefs about the environment

4.6.5.1. EFA

Beliefs about the environment consisted of 27 items measured using 3 constructs. Components were checked and items with communality less than .5 were removed; 15 items were removed. Further iterations revealed that 1 item that was under beliefs fitted in opportunities, 1 item under desires fitted in opportunities therefore, they were also removed leaving 10 items. The component of desires was subsequently dropped because it had only 1 item loading which was fitting in opportunities. According to Table 18

KMO = .90 which is a superb level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square=2502.736, DF=66, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .001 which shows that there is no multicollinearity or singularity between variables since it is greater than .000. Principle Component Analysis (PCA) extracted the three factors of beliefs about the environment with Eigenvalues >1. The eigenvalue for opportunities is 4.55, that of beliefs is 2.70 while that of desires is 1.11 which are both above 1. The rotated factor loadings for the items ranged between .72 and .84 after excluding that of desires with average communality of .72. The percentage variance explained by the three factors is 37.opportunities, 22.52 for beliefs and 9.25 for desires altogether giving 70% of the variance in beliefs about the environment.

Table 18: EFA results for beliefs about the environment

Rotated Component Matrix[a]

	Component		
	Opportunities Factor loadings	Beliefs Factor loadings	Desires Factor loadings
Implementing Green ICT can help recycle ICT hardware.	.845		
Implementing Green ICT can help re-use ICT hardware.	.843		
Implementing Green ICT can help reduce carbon emissions.	.829		
Implementing Green ICT can help reduce power consumption.	.807		
Implementing Green ICT can help reduce landfills of e-waste.	.806		
Implementing Green ICT can help reduce paper consumption	.778		
I believe the environment can be conserved through reduction of landfills of e-waste.		.785	
I believe the environment can be conserved through proper disposal of ICT hardware.		.763	
I believe the environment can be conserved by re-using ICT hardware.		.736	
I believe the environment can be conserved by recycling ICT hardware.		.716	
I desire to see a reduction in energy consumption.			.476
Eigen Value	4.55	2.702	1.11
% of Variance	37.92	22.519	9.254
Cumulative %	37.92	60.439	69.692
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.903		

	Approx. Chi-Square	2502.736
Bartlett's Test of Sphericity	Df	66
	Sig	.000
Determinant		.001
Average communality		.715

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 4 iterations.

4.6.5.2. CFA

CFA was used to confirm components of beliefs about the environment. Three factors of beliefs about the environment were confirmed namely Beliefs (BLF), Desires (DSS) and Opportunities (OPP). Further, CFA confirmed three measures for Beliefs, three measures for Desires and four measures for Opportunities. The model fit estimates for each factor are presented in Table 19. The results reveal that the individual factor models (Beliefs, Desires and Opportunities) fit the observed data well and hence are good representatives of beliefs about the environment. Therefore, the three factors were included in the CFA model for beliefs about the environment.

Figure 13 shows the CFA measurement model for Beliefs about the Environment (BENV) showing the relationship among the three factors BLF, DSS and OPP and observed variables. The results in Table 19 show that the model generated a chi-square value (CMIN/χ^2) of 188.68 and χ^2/df of 5.896 which is more than 5, with 32 degrees of freedom at P=.000 which is less than 0.5 and the RMSEA is .12 which is also more than .08 hence suggesting a poor model fit. Other goodness of fit measures indicate GFI of .917, AGFI of .857, NFI of .899, RFI of .857, IFI of .914, TLI of .879 and CFI of .914. Basing on GFI, IFI, CFI, and NFI, the model is fit.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the factors and observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship

between societal structure components and the observed variables. The three factors of beliefs about the environment correlate with most of them having correlations above .36 showing large correlation effects. Only one item has a correlation coefficient of .24 which is a small correlation effect. This means the dimensions of beliefs about the environment co-vary with each other.

The established model AVE is .55 which is above .5 while the discriminant validity (squared correlations) are .465, .369 and .459 for the relationships between BLF and DSS, DSS and OPP and BLF and OPP respectively; which are all less than the AVE. The AVE and discriminant validity confirm that the three constructs of beliefs about the environment are convergent and discriminant. Construct validity of the beliefs about the environment measurement scale is therefore, confirmed with three dimensions and ten items measures. As a result, there is no significant difference between the hypothesized and observed factors of beliefs about the environment on Green ICT practice in Uganda.

Figure 13: A Three Factor CFA for Beliefs about the environment with observed variables

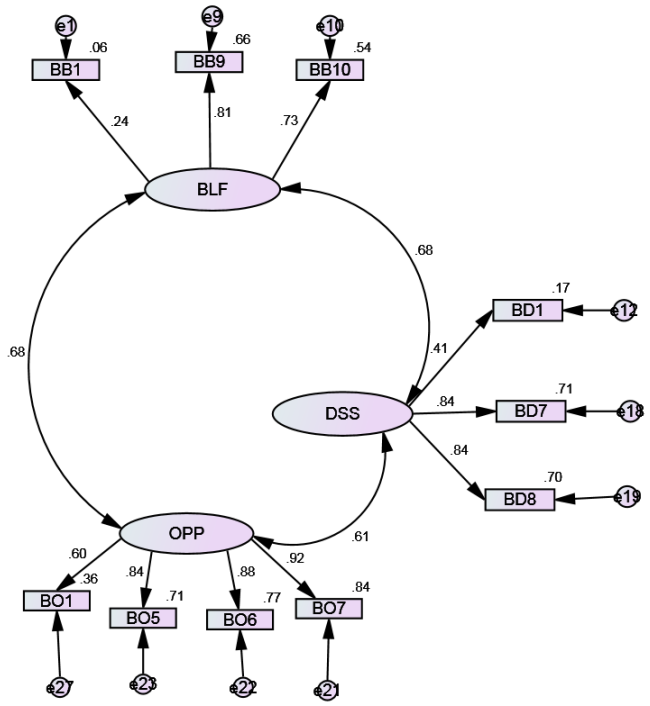


Table 19: CFA Model Estimates for Beliefs about the Environment

			B	S.E.	C.R.	β	P	AVE	Squared correlation
BB1	<---	BLF	1.000			.239		.552	.465
BB10	<---	BLF	2.042	.502	4.063	.733	***		.369
BD1	<---	DSS	1.000			.415			.459
BD8	<---	DSS	2.353	.314	7.493	.837	***		
BO1	<---	OPP	.595	.046	12.986	.604	***		
BB9	<---	BLF	2.415	.591	4.083	.810	***		
BD7	<---	DSS	2.627	.350	7.497	.843	***		
BO5	<---	OPP	.949	.043	22.311	.840	***		
BO7	<---	OPP	1.000			.919			
BO6	<---	OPP	1.028	.042	24.366	.879	***		

Model	χ^2	χ^2/df	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
BENV	188.681	5.896	.000	.917	.857	.899	.857	.914	.879	.914	.12

Source: Primary data

4.6.6. Identifiability

4.6.6.1 EFA

Identifiability consisted of 8 items measured using 1 point anchor. Components were checked for communalities less than .5 and 1 item was removed leaving 7 items. According to table 20 KMO = .90 which is a superb level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square =1620.275, DF=21, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .011 which shows that there is no multicollinearity or singularity between variables since it is greater than .00. Principle Component Analysis (PCA) extracted have Eigenvalues >1 (eigenvalue extracted is 4.62). The factor loadings for the items ranged between .72 and .89 with average communality of .66. The percentage variance explained is 65.97 meaning that the items explain 66% of the variance in identifiability.

Table 20: EFA results for identifiability

Component Matrix[a]

	Component
	Identifiability Factor loadings
Other people acknowledge my effort to recycle ICT hardware.	.886
Other people acknowledge my effort to re-use ICT hardware.	.858
Other people acknowledge my effort to dispose of ICT hardware in an environmentally friendly way.	.829
Other people acknowledge my effort to reduce the amount of carbon emission.	.818
Other people acknowledge my effort to reduce energy consumption.	.794
Other people acknowledge my effort to telecommute.	.773
Other people acknowledge my effort to reduce the amount of printing I do.	.717
Eigen Value	4.618
% of Variance	65.968
Cumulative %	65.968
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.903
Approx. Chi-Square	1620.275
Bartlett's Test of Sphericity Df	21
Sig	.000
Determinant	.011
Average communality	.659

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

4.6.6.2. CFA

CFA was used to confirm components of Identifiability (IDD). CFA confirmed six measures for the variable. The model fit estimates for each factor are presented in Table 21. The results reveal that the individual factor model fits the observed data well and hence is good representative of Identifiability.

Figure 14 shows the CFA measurement model for Identifiability. The results in table 21 show that the model generated a chi-square value (CMIN/χ^2) and of 43.046, with 9 degrees of freedom at P=.000 also less than 0.5 and the RMSEA is .1 hence suggesting a poor model fit. However, other goodness of fit indices reveals a good model fit. χ^2/df is 4.783 which is less than 5, GFI of .958, AGFI of .901, NFI of .966, RFI of .943, IFI of .973, TLI of .955 and CFI of .973. This shows that the model is fit because GFI, IFI, RFI, TLI are all >.9 while NFI and CFI are both close to 1.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between the observed variables of identifiability. The observed variables of identifiability correlate with all of them having correlation coefficients above .46 which indicate large correlation effects. This means the dimensions of identifiability co-vary with each other.

The established model AVE is .58 which is also above .5 indicating convergence and hence confirmation of the construct validity of the identifiability measurement scale with six items measures. Therefore, there is no significant difference between the hypothesized and observed factors of identifiability on the moderating relationship between beliefs about the environment and Green ICT practice in Uganda.

Figure 14: A one Factor CFA for Identifiability with observed variables

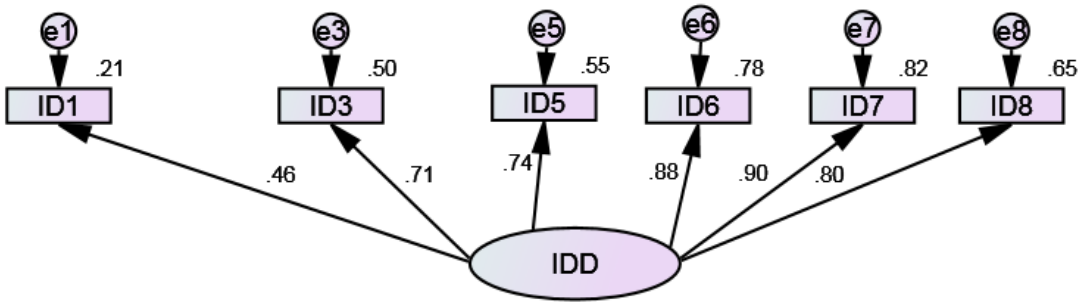


Table 21: CFA Model Estimates for Identifiability

			B	S.E.	C.R.	β	P	AVE
ID1	<---	IDD	1.000			.457		.583
ID3	<---	IDD	1.702	.204	8.333	.710	***	
ID6	<---	IDD	1.910	.212	9.000	.882	***	
ID7	<---	IDD	1.968	.217	9.059	.904	***	
ID8	<---	IDD	1.711	.196	8.733	.803	***	
ID5	<---	IDD	1.667	.197	8.480	.742	***	

Model	χ^2	χ^2/df	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
IDD	43.046	4.783	.000	.958	.901	.966	.943	.973	.955	.973	.10

4.6.7. Evaluation

4.6.7.1. EFA

Evaluation consisted of 8 items measured using 1 point anchor. Components were checked for communalities less than .5 and none of the items were removed. According to Table 22 KMO = .93 which is a superb level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square =2067.183, DF=28, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .003 which shows that there is no multicollinearity or singularity between variables since it is greater than .000. Principle Component Analysis (PCA) extracted have Eigenvalues >1 (eigenvalue extracted is 5.41). The factor loadings for the items ranged between .77 and .86 with average communality of .67. The percentage variance explained is 67.48 meaning that the items explain 67% of the variance in evaluation.

Table 22: EFA results for evaluation

Component Matrix[a]

	Component
	Evaluation Factor loadings
Other people evaluate my effort to re-use my ICT hardware.	.863
Other people evaluate my effort to dispose of ICT hardware in an environmentally friendly way.	.860
Other people evaluate my effort to recycle ICT hardware.	.860
Other people evaluate my effort to reduce the amount of printing I do.	.821
Other people evaluate my effort to reduce energy consumption.	.807
Other people evaluate my effort to telecommute.	.801
Other people evaluate my effort to reduce the amount of carbon emission.	.781
Other people evaluate my effort to purchase greener ICT hardware.	.773
Eigen Value	5.399
% of Variance	67.482
Cumulative %	67.482
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.926
Approx. Chi-Square	2067.183
Bartlett's Test of Sphericity Df	28
Sig	.000
Determinant	.003
Average communality	.674

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

4.6.7.2. CFA

CFA was used to confirm components of Evaluation (EVV). CFA confirmed seven measures for the variable. The model fit estimates for each factor are presented in Table 23. The results reveal that the individual factor model fits the observed data well and hence is good representative of Evaluation.

Figure 15 shows the CFA measurement model for Evaluation. The results in Table 23 show that the model generated a chi-square value (CMIN/χ^2) of 86.847 and χ^2/df of 6.203 which is more than 5, with 14 degrees of freedom at P=.000 also less than 0.5 and the RMSEA is .12 hence suggesting a poor model fit. Other goodness of fit indices however, reveals a good model fit with GFI of .928, AGFI of .856, NFI of .951, RFI of .927, IFI of .959, TLI of .938 and CFI of .956. This shows that the model is fit because GFI, IFI, RFI, TLI are all >.9 while NFI and CFI are both close to 1.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between the observed variables of Evaluation. The observed variables of Evaluation correlate with all of them having correlation coefficients above .73 which indicate large correlation effects. This means the dimensions of Evaluation co-vary with each other.

The established model AVE is .64 which is also above .5 indicating convergence and hence confirmation of the construct validity of the evaluation measurement scale with seven items measures. Therefore, there is no significant difference between the hypothesized and observed factors of Evaluation on the moderating relationship between beliefs about the environment and Green ICT practice in Uganda.

Figure 15: A one Factor CFA for Evaluation with observed variables

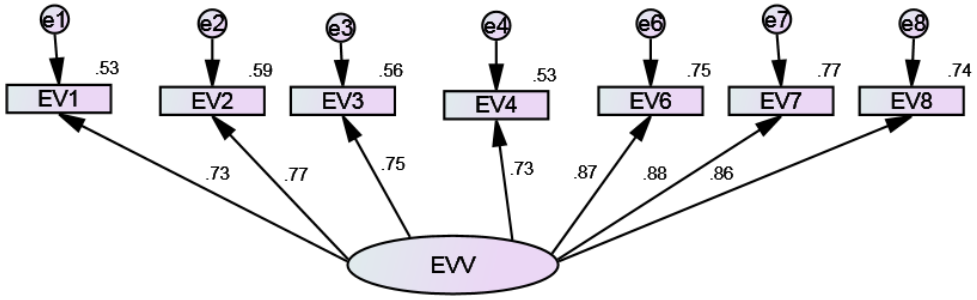


Table 23: CFA Model Estimates for Evaluation

			B	S.E.	C.R.	β	P	AVE
EV1	<---	EVV	1.000			.728		.638
EV2	<---	EVV	.992	.068	14.516	.769	***	
EV6	<---	EVV	1.150	.070	16.483	.868	***	
EV7	<---	EVV	1.185	.071	16.671	.877	***	
EV8	<---	EVV	1.171	.071	16.385	.863	***	
EV4	<---	EVV	.987	.072	13.699	.728	***	
EV3	<---	EVV	1.066	.076	14.054	.745	***	

Model	**χ^2**	**χ^2/df**	**P**	**GFI**	**AGFI**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**

			B	S.E.		C.R.		β		P	AVE	
EVV	86.847	6.203	.000	.928	.856	.951	.927	.959	.938	.959	.12	

Source: **Primary data**

4.6.8 Monitoring

4.6.8.1 EFA

Monitoring consisted of 8 items measured using 1 point anchor. Components were checked for communalities less than .5 and none of the items were removed. According to Table 24 KMO = .90 which is a superb level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square =1943.497, DF=28, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .004 which shows that there is no multicollinearity or singularity between variables since it is greater than .000. Principle Component Analysis (PCA) extracted have Eigenvalues >1 (eigenvalue extracted is 5.13). The factor loadings for the items ranged between .71 and .87 with average communality of .60. The percentage variance explained is 64.13 meaning that the items explain 64% of the variance in monitoring.

Table 24: EFA results for monitoring

Component Matrix[a]

	Component
	Monitoring Factor loadings
I am aware that other people are monitoring my effort to re-use ICT hardware.	.870
I am aware that other people are monitoring my effort to recycle ICT hardware.	.869
I am aware that other people are monitoring my effort to dispose of ICT hardware in an environmentally friendly way.	.852
I am aware that other people are monitoring my effort to reduce the amount of printing I do.	.802
I am aware that other people are monitoring my effort to reduce the amount of carbon emission.	.801
I am aware that other people are monitoring my effort to reduce energy consumption.	.750
I am aware that other people are monitoring my effort to purchase greener ICT hardware.	.728
I am aware that other people are monitoring my effort to telecommute.	.717
Eigen Value	5.131
% of Variance	64.133
Cumulative %	64.133
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.	.900

Bartlett's Test of Sphericity	Approx. Chi-Square	1943.497
	Df	28
	Sig	.000
Determinant		.004
Average communality		.60

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

4.6.8.2 CFA

CFA was used to confirm components of Monitoring (MMM). CFA confirmed seven measures for the variable. The model fit estimates for each factor are presented in Table 25. The results reveal that the individual factor model fits the observed data well and hence is good representative of Monitoring.

Figure 16 shows the CFA measurement model for Monitoring. The results in Table 25 show that the model generated a chi-square value (CMIN/χ^2) of 71.138 and χ^2/df of 7.904 which is more than 5, with 9 degrees of freedom at P=.000 which is less than 0.5 and the RMSEA is .14 hence suggesting a poor model fit. However, other goodness of fit indices reveals a good model fit with GFI of .938, AGFI of .856, NFI of .951, RFI of .918, IFI of .957, TLI of .928 and CFI of .957. This shows that the model is fit because GFI, IFI, RFI, TLI are all >.9 while NFI and CFI are both close to 1.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the observed variables. Therefore, the regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between the observed variables of Monitoring. The observed variables of Monitoring correlate with all of them having correlation coefficients above .68 which indicate large correlation effects. This means the dimensions of Evaluation co-vary with each other.

The established model AVE is .63 which is also above .5 indicating convergence and hence confirmation of the construct validity of the identifiability measurement scale with

six items measures. Therefore, there is no significant difference between the hypothesized and observed factors of Monitoring on the moderating relationship between beliefs about the environment and Green ICT practice in Uganda.

Figure 16: A one Factor CFA for Monitoring with observed variables

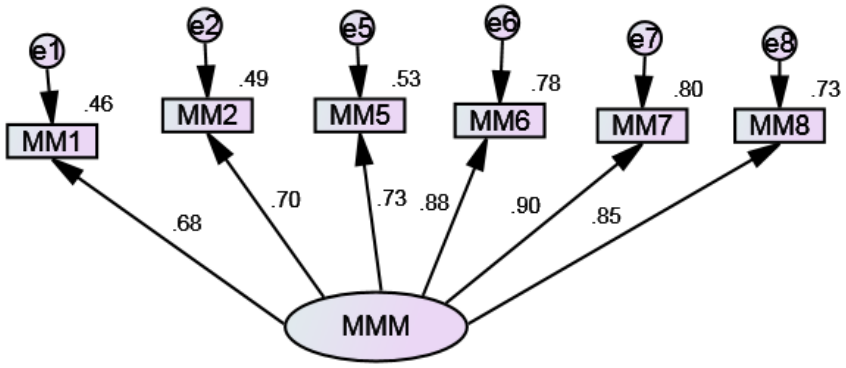


Table 25: CFA Model Estimates of Monitoring

			B	S.E.	C.R.	β	P	AVE
MM1	<---	MMM	1.000			.678		.632
MM8	<---	MMM	1.252	.086	14.584	.854	***	
MM2	<---	MMM	.977	.080	12.224	.699	***	
MM5	<---	MMM	1.084	.086	12.674	.728	***	
MM6	<---	MMM	1.342	.089	15.008	.884	***	
MM7	<---	MMM	1.324	.087	15.158	.895	***	

Model	χ^2	χ^2/df	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
MMM	71.138	7.904	.000	.938	.856	.951	.918	.957	.928	.957	.14

Source: **Primary data**

4.6.9. Green ICT practice

4.6.9.1 EFA

Green ICT practice consisted of 22 items measured using 3 constructs. Components were checked and items with communality less than .5 were removed; 11 items were removed. Further iterations revealed that 1 item that was under IT equipment acquisition fitted in IT equipment disposal and 2 items under IT equipment use fitted in IT equipment acquisition, therefore, they were also removed leaving 8 items. According to Table 26

KMO = .83 which is a great level of sampling adequacy. Bartlett's test of sphericity of Approx.Chi-Square= 1863.799, DF=55, p=.000 is significant, which indicates that correlations between items were sufficiently large for factor analysis. The determinant = .005 which shows that there is no multicollinearity or singularity between variables since it is greater than .000. Principle Component Analysis (PCA) extracted both the three factors of Green ICT practice with Eigenvalues >1. The eigenvalue for IT equipment disposal is 3.12, IT equipment use is 2.28 while that of IT equipment acquisition is 2.11 which are above 1. The rotated factor loadings for the items ranged between .78 and .87 with average communality of .61. The percentage variance explained by the three factors is 28.34 for IT equipment disposal, 20.74 for IT equipment use and 19.05 for IT equipment acquisition altogether giving 68% of the variance in Green ICT practice.

Table 26: EFA results for Green ICT practice

Rotated Component Matrix[a]

	Component		
	IT Equipment Disposal	IT Equipment Use	IT Equipment Acquisition
I adhere to policies that guide disposal of ICT equipment when disposing them	.870		
I consider the environment when disposing ICT equipment.	.844		
I dispose of ICT equipment in designated or gazetted places.	.810		
I dispose of ICT equipment in an environmentally friendly manner.	.775		
I reduce paper consumption by electronically archiving documents.		.872	
I reduce paper consumption by mostly reading on screen rather than printing.		.853	
I reduce paper consumption by using smaller font and margins.		.823	
When purchasing IT equipment, I buy any that has an environment logo (e.g. Electronic Product Environmental Assessment Tool registered products).			.809
Eigen value	3.118	2.281	2.095
% of Variance	28.342	20.74	19.047
Cumulative %	28.342	49.082	68.129
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.			.827
Bartlett's Test of Sphericity Approx. Chi-Square			1863.799
Bartlett's Test of Sphericity Df			55
Bartlett's Test of Sphericity Sig			.000
Determinant			.005
Average communality			.746

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

After the factor analysis, data was transformed leaving only the most important factors and variables were computed to be used in the subsequent analyses. This helped to further reduce the items on the questionnaire.

4.6.9.2. CFA

CFA was used to confirm components of Green ICT practice (GICTP). Three factors of Green ICT practice were confirmed namely IT Acquisition (ITACQ), IT use (ITUS) and IT disposal (ITDIS). Further, CFA confirmed two measures for IT Acquisition, three measures for IT use and four measures for IT disposal. The model fit estimates for each factor are presented in Table 27. The results reveal that the individual factor models (IT Acquisition, IT use and IT disposal) fit the observed data well and hence are good representatives of Green ICT practice. Therefore, the three factors were included in the CFA model for Green ICT practice.

Figure 17 shows the CFA measurement model for Green ICT practice (GICTP) showing the relationship among the three factors ITACQ, ITUS and ITDIS and observed variables. The results in Table 27 show that the model generated a chi-square value (CMIN/χ^2) of 71.564, with 24 degrees of freedom at P=.000 which is less than 0.5 hence suggesting a poor model fit. Other goodness of fit measures indicate χ^2/df of 2.982, GFI of .956, AGFI of .918, NFI of .949, RFI of .924, IFI of .966, TLI of .948 and CFI of .966. Basing on χ^2/df, GFI, IFI, CFI, and NFI, the model is fit because GFI, IFI, RFI, TLI are all >.9 while NFI and CFI are both close to 1. RMSEA is .07 which is less than .08, and χ^2/df is less than 5 therefore, also indicating fitness of the model.

Statistical estimates indicate p-values were less than .001 pointing to existence of significant relationships between the factors and observed variables. Therefore, the

regression coefficients in the model are significantly different from zero. A comparison of regression weights with their standard errors confirms existence of a relationship between Green ICT practice components and the observed variables. The three factors of Green ICT practice correlate with most of them having correlations above .39 showing large correlation effects. Only one item has a correlation coefficient of .24 which is a small correlation effect. This means the dimensions of Green ICT practice co-vary with each other.

The established model AVE is .55 which is above .5 confirming that the three constructs of Green ICT practice are convergent. The discriminant validity (squared correlations) are .383, .585 and .153 for the relationships between ITU and ITACQ, ITUS and ITDIS and ITDIS and ITACQ respectively. Discriminant validity for ITU and ITACQ, and ITDIS and ITACQ show that they are discriminant, however, that of ITUS and ITDIS is not discriminant because it is higher than the AVE. Construct validity of the Green ICT practice measurement scale is therefore, confirmed with three dimensions and nine items measures. As a result, there is no significant difference between the hypothesized and observed factors of Green ICT practice in Uganda.

Figure 17: A three Factor CFA for Green ICT practice with observed variables

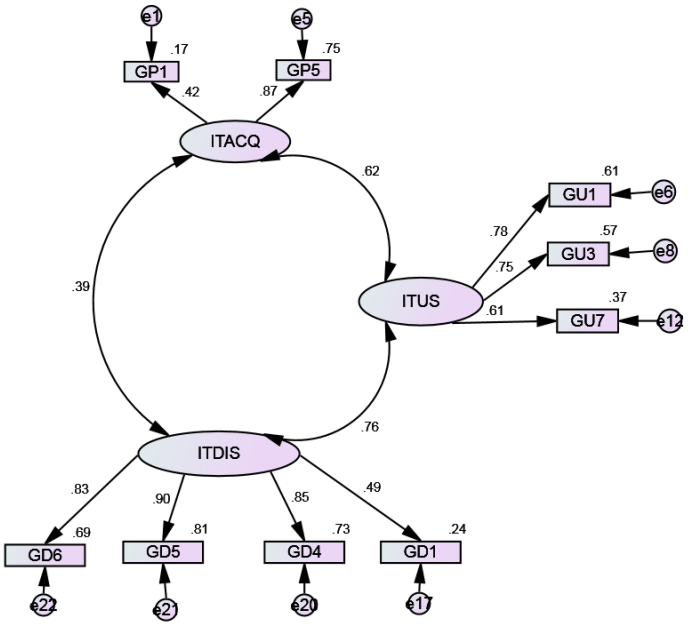


Table 27: CFA Model Estimates for Green ICT Practice

			B	S.E.	C.R.	β	P	AVE	Squared correlations
GU7	<---	ITUS	.812	.075	10.874	.611	***	.548	.383
GD1	<---	ITDIS	1.000			.488			.585
GD6	<---	ITDIS	1.658	.176	9.441	.832	***		.153
GP5	<---	ITACQ	1.816	.395	4.599	.866	***		
GP1	<---	ITACQ	1.000			.417			
GD4	<---	ITDIS	1.721	.181	9.525	.853	***		
GD5	<---	ITDIS	1.814	.187	9.677	.898	***		
GU3	<---	ITUS	.968	.072	13.366	.754	***		
GU1	<---	ITUS	1.000			.778			

Model	χ^2	χ^2/df	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
GICTP	71.564	2.982	.000	.956	.918	.949	.924	.966	.948	.966	.07

Source: **Primary data**

4.7 Relationship between study variables

In order to test for the relationship between study variables, correlation analysis was done, while multiple regression was done to test the hypotheses. Thereafter Modgraphs were estimated using the Modgraph of Paul Jose in Ms Excel to confirm the relationship

between moderating variables and the dependent variable. The results are presented in the following subsections.

4.7.1 Correlation

Correlation was used to measure and describe the direction and strength of the relationship between variables (Field, 2009). Bivariate Pearson correlation for normally distributed data was run to look for relationship between variables. Some items in some of the variables were removed to include only important factors after the Exploratory Factor Analysis. According to Field (2009) the correlation coefficient lies between −1 and +1 with a coefficient of +1 indicating a perfect positive relationship, a coefficient of −1 indicating a perfect negative relationship and a coefficient of 0 indicating no linear relationship. Values of ±.1 represent a small effect, ±.3 is a medium effect and ±.5 is a large effect. Table 28 presents the results of the correlation analysis.

Table 28: Correlation Results[1]

Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
CInfluence	1	.359**	.840**	.278**	.217**	.202**	.234**	.248**	.270**	.260**	.214**	.235**	.189**	.211**	.271**	.306**
NPatterns	.359**	1	.808**	.435**	.243**	.209**	.224**	.298**	.292**	.223**	.163**	.247**	.190**	.306**	.301**	.356**
SStructure	.840**	.808**	1	.428**	.278**	.249**	.278**	.329**	.340**	.294**	.230**	.292**	.230**	.311**	.346**	.400**
ICTEduc	.278**	.435**	.428**	1	.314**	.325**	.293**	.314**	.340**	.301**	.248**	.357**	.276**	.272**	.441**	.454**
ICTPolicies	.217**	.243**	.278**	.314**	1	.491**	.134*	.153**	.160**	.377**	.399**	.447**	.321**	.207**	.188**	.332**
OrgStructure	.202**	.209**	.249**	.325**	.491**	1	.224**	.244**	.262**	.428**	.433**	.422**	.380**	.231**	.240**	.396**
Beliefs	.234**	.224**	.278**	.293**	.134*	.224**	1	.599**	.892**	.248**	.131*	.132*	.117*	.360**	.130*	.256**
Opportunities	.248**	.298**	.329**	.314**	.153**	.244**	.599**	1	.896**	.209**	.125*	.160**	.208**	.398**	.229**	.364**
BelAboutEnvironment	.270**	.292**	.340**	.340**	.160**	.262**	.892**	.896**	1	.256**	.143**	.163**	.182**	.424**	.201**	.347**
Identifiability	.260**	.223**	.294**	.301**	.377**	.428**	.248**	.209**	.256**	1	.723**	.577**	.352**	.262**	.204**	.376**
Evaluation	.214**	.163**	.230**	.248**	.399**	.433**	.131*	.125*	.143**	.723**	1	.705**	.297**	.186**	.238**	.335**
Monitoring	.235**	.247**	.292**	.357**	.447**	.422**	.132*	.160**	.163**	.577**	.705**	1	.390**	.172**	.327**	.420**
ITAcquition	.189**	.190**	.230**	.276**	.321**	.380**	.117*	.208**	.182**	.352**	.297**	.390**	1	.314**	.298**	.771**
ITUse	.211**	.306**	.311**	.272**	.207**	.231**	.360**	.398**	.424**	.262**	.186**	.172**	.314**	1	.289**	.671**
ITDisposal	.271**	.301**	.346**	.441**	.188**	.240**	.130*	.229**	.201**	.204**	.238**	.327**	.298**	.289**	1	.741**
GreenICTPractice	.306**	.356**	.400**	.454**	.332**	.396**	.256**	.364**	.347**	.376**	.335**	.420**	.771**	.671**	.741**	1

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

According to the results in Table 28, cultural influence is positively correlated to normative patterns, with a coefficient of r = .36, which is significant at p < .001. Cultural influence is positively correlated to societal structure with a coefficient of r =.84. Normative patterns are positively correlated to societal structure with a coefficient of r =.81. Cultural influence is positively correlated to ICT education with a coefficient of r =.28. Normative patterns are positively correlated to ICT education with a coefficient of r

[1] Where 1 – Cultural influence, 2 – Normative Patterns, 3 – Societal Structure, 4 – ICT Education, 5 – ICT policies, 6 – Organisational structure, 7 – Beliefs, 8 – Opportunities, 9 – Beliefs about the environment, 10 – Identifiability, 11 – Evaluation, 12 – Monitoring, 13 – IT acquisition, 14 – IT Use, 15 – IT Disposal and 16 – Green ICT Practice.

=.44. Societal structure is positively correlated to ICT education with a coefficient of r =.43.

Cultural influence is positively correlated to ICT policies with a coefficient of r =.22. Normative patterns are positively correlated to ICT policies with a coefficient of r =.24. Societal structure is positively correlated to ICT policies with a coefficient of r =.28. ICT education is positively correlated to ICT policies with a coefficient of r =.31.

Cultural influence is positively correlated to organisational structure with a coefficient of r =.20. Normative patterns are positively correlated to organisational structure with a coefficient of r =.21. Societal structure is positively correlated to organisational structure with a coefficient of r =.25. ICT education is positively correlated to organisational structure with a coefficient of r =.33. ICT policies is positively correlated to organisational structure with a coefficient of r =.41.

Cultural influence is positively correlated to beliefs with a coefficient of r =.23. Normative patterns are positively correlated to beliefs with a coefficient of r =.22. Societal structure is positively correlated to beliefs with a coefficient of r =.28. ICT education is positively correlated to beliefs with a coefficient of r =.29. ICT policies is positively correlated to beliefs with a coefficient of r =.13. Organisational structure is positively correlated to beliefs with a coefficient of r =.22.

Cultural influence is positively correlated to opportunities with a coefficient of r =.25. Normative patterns are positively correlated to opportunities with a coefficient of r =.30. Societal structure is positively correlated to opportunities with a coefficient of r =.33. ICT education is positively correlated to opportunities with a coefficient of r =.31. ICT policies is positively correlated to opportunities with a coefficient of r =.15. Organisational structure is positively correlated to opportunities with a coefficient of r =.24. Beliefs is positively correlated to opportunities with a coefficient of r =.60.

Cultural influence is positively correlated to beliefs about the environment with a coefficient of r =.27. Normative patterns are positively correlated to beliefs about the environment with a coefficient of r =.29. Societal structure is positively correlated to beliefs about the environment with a coefficient of r =.34. ICT education is positively correlated to beliefs about the environment with a coefficient of r =.34. ICT policies is positively correlated to beliefs about the environment with a coefficient of r =.16. Organisational structure is positively correlated to beliefs about the environment with a coefficient of r =.26. Beliefs is positively correlated to beliefs about the environment with a coefficient of r =.89. Opportunities is positively correlated to beliefs about the environment with a coefficient of r =.90.

Cultural influence is positively correlated to identifiability about the environment with a coefficient of r =.26. Normative patterns are positively correlated to identifiability with a coefficient of r =.22. Societal structure is positively correlated to identifiability with a coefficient of r =.29. ICT education is positively correlated to identifiability with a coefficient of r =.30. ICT policies is positively correlated to identifiability with a coefficient of r =.37. Organisational structure is positively correlated to identifiability with a coefficient of r =.43. Beliefs is positively correlated to identifiability with a coefficient of r =.25. Opportunities is positively correlated to identifiability with a coefficient of r =.21. Beliefs about the environment is positively correlated to identifiability with a coefficient of r =.26.

Cultural influence is positively correlated to evaluation about the environment with a coefficient of r =.21. Normative patterns are positively correlated to evaluation with a coefficient of r =.16. Societal structure is positively correlated to evaluation with a coefficient of r =.23. ICT education is positively correlated to evaluation with a coefficient of r =.25. ICT policies is positively correlated to evaluation with a coefficient of r =.40. Organisational structure is positively correlated to evaluation with a coefficient of r =.43. Beliefs is positively correlated to evaluation with a coefficient of r =.13.

Opportunities is positively correlated to evaluation with a coefficient of r =.13. Beliefs about the environment is positively correlated to evaluation with a coefficient of r =.14. Identifiability is positively correlated to evaluation with a coefficient of r =.72.

Cultural influence is positively correlated to monitoring about the environment with a coefficient of r =.24. Normative patterns are positively correlated to monitoring with a coefficient of r =.25. Societal structure is positively correlated to monitoring with a coefficient of r =.30. ICT education is positively correlated to monitoring with a coefficient of r =.36. ICT policies is positively correlated to monitoring with a coefficient of r =.45. Organisational structure is positively correlated to monitoring with a coefficient of r =.42. Beliefs is positively correlated to monitoring with a coefficient of r =.13. Opportunities is positively correlated to monitoring with a coefficient of r =.16. Beliefs about the environment is positively correlated to monitoring with a coefficient of r =.16. Identifiability is positively correlated to monitoring with a coefficient of r =.58. Evaluation is positively correlated to monitoring with a coefficient of r =.71.

Cultural influence is positively correlated to IT acquisition about the environment with a coefficient of r =.19. Normative patterns are positively correlated to IT acquisition with a coefficient of r =.19. Societal structure is positively correlated to IT acquisition with a coefficient of r =.23. ICT education is positively correlated to IT acquisition with a coefficient of r =.28. ICT policies is positively correlated to IT acquisition with a coefficient of r =.31. Organisational structure is positively correlated to IT acquisition with a coefficient of r =.38. Beliefs is positively correlated to IT acquisition with a coefficient of r =.12. Opportunities is positively correlated to IT acquisition with a coefficient of r =.21. Beliefs about the environment is positively correlated to IT acquisition with a coefficient of r =.18. Identifiability is positively correlated to IT acquisition with a coefficient of r =.35. Evaluation is positively correlated to IT acquisition with a coefficient of r =.28. Monitoring is positively correlated to IT acquisition with a coefficient of r =.39.

Cultural influence is positively correlated to IT use about the environment with a coefficient of r =.21. Normative patterns are positively correlated to IT use with a coefficient of r =.31. Societal structure is positively correlated to IT use with a coefficient of r =.31. ICT education is positively correlated to IT use with a coefficient of r =.27. ICT policies is positively correlated to IT use with a coefficient of r =.21. Organisational structure is positively correlated to IT use with a coefficient of r =.23. Beliefs is positively correlated to IT use with a coefficient of r =.30. Opportunities is positively correlated to IT use with a coefficient of r =.40. Beliefs about the environment is positively correlated to IT use with a coefficient of r =.42. Identifiability is positively correlated to IT use with a coefficient of r =.26. Evaluation is positively correlated to IT use with a coefficient of r =.19. Monitoring is positively correlated to IT use with a coefficient of r =.17. IT acquisition is positively correlated to IT use with a coefficient of r =.31.

Cultural influence is positively correlated to IT disposal about the environment with a coefficient of r =.27. Normative patterns are positively correlated to IT disposal with a coefficient of r =.30. Societal structure is positively correlated to IT disposal with a coefficient of r =.35. ICT education is positively correlated to IT disposal with a coefficient of r =.44. ICT policies is positively correlated to IT disposal with a coefficient of r =.19. Organisational structure is positively correlated to IT disposal with a coefficient of r =.24. Beliefs is positively correlated to IT disposal with a coefficient of r =.13. Opportunities is positively correlated to IT disposal with a coefficient of r =.23. Beliefs about the environment is positively correlated to IT disposal with a coefficient of r =.20. Identifiability is positively correlated to IT disposal with a coefficient of r =.20. Evaluation is positively correlated to IT disposal with a coefficient of r =.24. Monitoring is positively correlated to IT disposal with a coefficient of r =.33. IT acquisition is positively correlated to IT disposal with a coefficient of r =.30. IT use is positively correlated to IT disposal with a coefficient of r =.29.

Cultural influence is positively correlated to Green ICT practice about the environment with a coefficient of r =.31. Normative patterns are positively correlated to Green ICT practice with a coefficient of r =.36. Societal structure is positively correlated to Green ICT practice with a coefficient of r =.40. ICT education is positively correlated to Green ICT practice with a coefficient of r =.45. ICT policies is positively correlated to Green ICT practice with a coefficient of r =.33. Organisational structure is positively correlated to Green ICT practice with a coefficient of r =.40. Beliefs is positively correlated to Green ICT practice with a coefficient of r =.26. Opportunities is positively correlated to Green ICT practice with a coefficient of r =.36. Beliefs about the environment is positively correlated to Green ICT practice with a coefficient of r =.35. Identifiability is positively correlated to Green ICT practice with a coefficient of r =.38. Evaluation is positively correlated to Green ICT practice with a coefficient of r =.34. Monitoring is positively correlated to Green ICT practice with a coefficient of r =.42. IT acquisition is positively correlated to Green ICT practice with a coefficient of r =.77. IT use is positively correlated to Green ICT practice with a coefficient of r =.67. IT disposal is positively correlated to Green ICT practice with a coefficient of r =.74. All the relationships are significant at $p<.001$ (2-tailed).

Succinctly, the correlation found that some relationships represented a small positive effect. These included the relationship between cultural influence and ICT education. For ICT policies; the relationships between cultural influence and ICT policies, normative patterns and ICT policies, societal structure and ICT policies represent a small positive effect. For organisational culture; the relationships between cultural influence and organisational structure, normative patterns and organisational structure, societal structure and organisational structure represent a small positive effect. For beliefs, the relationships between Cultural influence and beliefs, normative patterns and beliefs, societal structure and beliefs, ICT education and beliefs, ICT policies and beliefs, organisational structure and beliefs represent a small positive effect. For opportunities the relationships between cultural influence and opportunities, ICT policies and opportunities, organisational structure and opportunities represent a small positive effect.

For beliefs about the environment the relationships between cultural influence and beliefs about the environment, normative patterns and beliefs about the environment, ICT policies and beliefs about the environment, organisational structure and beliefs about the environment represent a small positive effect. For identifiability, the relationships between cultural influence and identifiability, normative patterns and identifiability, societal structure and identifiability, beliefs and identifiability, opportunities and identifiability, beliefs about the environment and identifiability represent a small positive effect. For evaluation, the relationships between cultural influence and evaluation, normative patterns and evaluation, societal structure and evaluation, ICT education and evaluation, beliefs and evaluation, opportunities and evaluation, beliefs about the environment and evaluation represent a small positive effect. For monitoring, the relationships between cultural influence and monitoring, normative patterns and monitoring, beliefs and monitoring, opportunities and monitoring, beliefs about the environment and monitoring represent a small positive effect. For IT acquisition the relationships between cultural influence and IT acquisition, normative and IT acquisition, societal structure and IT acquisition, ICT education and IT acquisition, beliefs and IT acquisition, opportunities and IT acquisition, beliefs about the environment and IT acquisition, evaluation and IT acquisition represent a small positive effect. For IT use the relationships between cultural influence and IT use, ICT education and IT use, ICT policies and IT use, organisational structure and IT use, identifiability and IT use, evaluation and IT use, monitoring and IT use represent a small positive effect. For IT disposal, the relationships between cultural influence and IT disposal, ICT policies and IT disposal, organisational structure and IT disposal, beliefs and IT disposal, opportunities and IT disposal, beliefs about the environment and IT disposal, identifiability and IT disposal, evaluation and IT disposal, IT use and IT disposal represent a small positive effect. For Green ICT practice the relationship between beliefs and Green ICT practice represent a small positive effect.

Some relationships were also found to represent a medium positive effect; Cultural influence and normative patterns. For ICT education normative patterns and ICT

education, societal structure and ICT education represent a medium positive effect while ICT education and ICT policies represents a medium positive effect. For organisational structure ICT education and organisational structure, ICT policies and organisational structure represent a medium positive effect. For opportunities, normative patterns and opportunities, societal structure and opportunities, ICT education and opportunities represent a medium positive effect. For beliefs about the environment, societal structure and beliefs about the environment, ICT education and beliefs about the environment represent a medium positive effect. For identifiability, ICT education and identifiability, ICT policies and identifiability, organisational structure and identifiability represent a medium positive effect. For evaluation, ICT policies and evaluation, organisational structure and evaluation represent a medium positive effect. For monitoring, societal structure and monitoring, ICT education and monitoring, ICT policies and monitoring, organisational structure and monitoring represent a medium positive effect. For IT acquisition, ICT policies and IT acquisition, organisational structure and IT acquisition, identifiability and IT acquisition, monitoring and IT acquisition represent a medium positive effect. For IT use, normative patterns and IT use, societal structure and IT use, beliefs and IT use, opportunities and IT use, beliefs about the environment and IT use, IT acquisition and IT use represent a medium positive effect. For IT disposal, normative patterns and IT disposal, societal structure and IT disposal, ICT education and IT disposal, monitoring and IT disposal, IT acquisition and IT disposal represent a medium positive effect. For Green ICT practice, cultural influence and Green ICT practice, normative patterns and Green ICT practice, societal structure and Green ICT practice, ICT education and Green ICT practice, ICT policies and Green ICT practice, organisational structure and Green ICT practice, opportunities and Green ICT practice, beliefs about the environment and Green ICT practice, identifiability and Green ICT practice, evaluation and Green ICT practice, monitoring and Green ICT practice represent a positive medium effect.

Lastly the rest of the relationships represented a large positive effect; cultural influence and societal structure, normative patterns and societal structure, beliefs and opportunities,

beliefs and beliefs about the environment, opportunities and beliefs about the environment, identifiability and evaluation, identifiability and monitoring, evaluation and monitoring, IT acquisition and Green ICT practice, IT use and Green ICT practice, IT disposal and Green ICT practice.

4.7.2 Regression

Multiple regression is a linear model in which one variable or outcome is predicted from many predictor variables (Field, 2009, p.793). Linear regression was analysed again after transforming data to use only important factors to describe the relationship between the predictors and outcome variables and to establish if the model is significant to predict variability in beliefs about the environment and Green ICT. These helped to test the hypotheses.

4.7.2.1 Regression model for the independent variables and mediating variable

The first linear regression analysis was to model the relationship between predictor variables (gender, age group, level of education, type of organisation, societal structure, ICT education, ICT policies and organisational structure) and outcome variable (beliefs about the environment). The results are presented in Table 29 showing model summary and ANOVA;

Table 29: Regression Model summary and ANOVA for predictor variables and Mediator variable

Model Summary[f]										ANOVA	
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig.
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.217[a]	.047	.036	.61614	.047	4.409	4	357	.002	4.409	.002[b]
2	.397[b]	.157	.146	.58019	.110	46.609	1	356	.000	13.300	.000[c]
3	.450[c]	.202	.189	.56525	.045	20.068	1	355	.000	15.022	.000[d]
4	.450[d]	.203	.187	.56600	.000	.062	1	354	.804	12.850	.000[e]
5	.473[e]	.224	.206	.55928	.021	9.548	1	353	.002	12.709	.000[f]

Model Summary[f]

a. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies

e. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies, OrgStructure

f. Dependent Variable: BelAboutEnviron

ANOVA

a. Dependent Variable: BelAboutEnviron

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc

e. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies

f. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies, OrgStructure

The results in Table 29 reveal in Model 5 that type of organisation, age group, gender, level of education, societal structure, ICT education, ICT policies and organisational structure account for 22.4% of the variability in beliefs about the environment. The model is useful for predicting beliefs about the environment with F-ratio (F) of 12.71 which is significant at $p<0.001$ (significance is .000).

Table 30 presents the coefficients for the study variables;

Table 30: Coefficients for Predictor variables and Mediator variable

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.880	.204		19.053	.000		
	Gender	-.122	.066	-.096	-1.837	.067	.980	1.020
	Age group	.049	.052	.050	.940	.348	.927	1.079
	Highest level of education	.090	.031	.162	2.951	.003	.881	1.135
	Type of organisation	-.012	.047	-.014	-.263	.793	.920	1.086
2	(Constant)	2.597	.268		9.676	.000		
	Gender	-.069	.063	-.055	-1.102	.271	.966	1.035
	Age group	.045	.049	.047	.923	.357	.927	1.079
	Highest level of education	.082	.029	.147	2.824	.005	.879	1.138
	Type of organisation	-.055	.045	-.063	-1.234	.218	.902	1.108
	SStructure	.343	.050	.337	6.827	.000	.969	1.032
3	(Constant)	2.408	.265		9.092	.000		
	Gender	-.068	.061	-.054	-1.117	.265	.966	1.035

	Age group	.040	.048	.041	.833	.405	.926	1.079
	Highest level of education	.083	.028	.149	2.957	.003	.879	1.138
	Type of organisation	-.052	.044	-.059	-1.182	.238	.902	1.109
	SStructure	.240	.054	.236	4.446	.000	.794	1.259
	ICTEduc	.165	.037	.235	4.480	.000	.816	1.226
	(Constant)	2.398	.268		8.937	.000		
	Gender	-.068	.061	-.054	-1.117	.265	.966	1.036
	Age group	.040	.048	.041	.840	.401	.925	1.081
4	Highest level of education	.083	.028	.148	2.924	.004	.873	1.145
	Type of organisation	-.052	.044	-.059	-1.185	.237	.902	1.109
	SStructure	.238	.055	.234	4.340	.000	.773	1.293
	ICTEduc	.163	.038	.232	4.302	.000	.774	1.292
	ICTPolicies	.009	.037	.013	.248	.804	.870	1.149
	(Constant)	2.378	.265		8.963	.000		
	Gender	-.085	.061	-.067	-1.402	.162	.958	1.044
	Age group	.055	.048	.056	1.152	.250	.916	1.091
	Highest level of education	.076	.028	.137	2.726	.007	.869	1.151
5	Type of organisation	-.055	.043	-.063	-1.280	.201	.901	1.110
	SStructure	.227	.054	.223	4.171	.000	.770	1.299
	ICTEduc	.142	.038	.202	3.736	.000	.750	1.334
	ICTPolicies	-.043	.041	-.059	-1.061	.289	.719	1.391
	OrgStructure	.107	.035	.172	3.090	.002	.708	1.412

a. Dependent Variable: BelAboutEnviron

According to Model 5 in Table 30, a person's gender negatively changes beliefs about the environment by 8.5%; and is not significant at p<.05 (significance is .162). VIF and Tolerance for gender is 1.04 and .958 respectively. For every change in age group, beliefs about the environment increase by 5.5%; and is not significant at p<.05 (significance is .250). VIF and Tolerance for age group is 1.09 and .916 respectively. For every increase in the level of education, beliefs about the environment increases by 7.6%; which is not significant at p<.005 (significance is .007). VIF and Tolerance for level of education is 1.15 and .869 respectively. The type of organisation one works for decreases beliefs about the environment by 5.5%; which is not significant at p<.005 (significance is .201). VIF and Tolerance for type of organisation is 1.11 and .901 respectively.

Additionally, a change in societal structure increases beliefs about the environment by 22.7%, which is significant at p<.005 (significance is .001). VIF and Tolerance for societal structure is 1.23 and .770 respectively. For every increase in ICT education, beliefs about the environment increases by 14.2%; which is significant at p<.001

(significance is .000). VIF and Tolerance for ICT education is 1.33 and .750 respectively. A change in ICT policies decreases beliefs about the environment by 4.3%, and is not significant at p<.005 (significance is .289). VIF and Tolerance for societal structure is 1.39 and .719 respectively. Lastly, a change in organisational structure increases beliefs about the environment by 10.7%, which is significant at p<.005 (significance is .002). VIF and Tolerance for societal structure is 1.41 and .708 respectively.

The results of Table 30 show that all the demographics (gender, age group, level of education and type of organisation) together with ICT policies are not significant predictors of variability in beliefs about the environment. VIF for all the predictor variables are below 10 and Tolerance is above 0.1. The average VIF for all the variables is 1.23 which is not significantly more than 1 meaning there is no cause for concern on collinearity.

Subsequently, according to the results; hypothesis H1: Societal structure has a positive effect on beliefs about the environment has been supported. Hypothesis H2: ICT Education has a positive effect on beliefs about the environment has been supported. Hypothesis H3: ICT policies have a positive effect on beliefs about the environment has been not been supported. Hypothesis H4: Organisational structure has a positive effect on beliefs about the environment has been supported.

4.7.2.2 Regression model for the cultural influence, normative patterns and mediating variable

The researcher went further to model the relationship between predictor variables (gender, age group, level of education, type of organisation, cultural influence and normative patterns) and outcome variable (beliefs about the environment) to see the effect of each individual construct of the variable societal structure. Table 31 presents the model summary and ANOVA of the model.

Table 31: Regression model summary and ANOVA for cultural influence, normative patterns and Mediator variable

Model Summary										ANOVA	
Model	F	Sig.	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.217[a]	.047	.036	.61614	.047	4.409	4	357	.002	4.409	.002[b]
2	.336[b]	.113	.100	.59538	.066	26.327	1	356	.000	9.043	.000[c]
3	.399[c]	.159	.145	.58049	.046	19.499	1	355	.000	11.177	.000[d]

Model summary

a. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, CInfluence

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, CInfluence, NPatterns

ANOVA

a. Dependent Variable: BelAboutEnviron

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, CInfluence

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, CInfluence, NPatterns

The results in Model 3 of table 31 show the type of organisation, age group, gender, level of education, cultural influence and normative patterns account for 14.5% of the variability in beliefs about the environment. The model is useful for predicting beliefs about the environment with F-ratio (F) of 11.18 which is significant at $p<0.001$ (significance is .000). This however, did not significantly improve the extent to which societal structure causes variability in beliefs about the environment.

The coefficients for the relationship between cultural influence, normative patterns and beliefs about the environment are presented in Table 32;

Table 32: Coefficients results for cultural influence, normative patterns and Mediator variable

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.880	.204		19.053	.000

	Gender	-.122	.066	-.096	-1.837	.067
	Age group	.049	.052	.050	.940	.348
	Highest level of education	.090	.031	.162	2.951	.003
	Type of organisation	-.012	.047	-.014	-.263	.793
	(Constant)	3.126	.245		12.735	.000
2	Gender	-.084	.064	-.066	-1.303	.193
	Age group	.048	.051	.050	.955	.340
	Highest level of education	.078	.030	.140	2.616	.009
	Type of organisation	-.048	.046	-.054	-1.035	.301
	CInfluence	.210	.041	.261	5.131	.000
	(Constant)	2.577	.270		9.554	.000
	Gender	-.070	.063	-.055	-1.118	.264
	Age group	.045	.049	.046	.914	.361
3	Highest level of education	.084	.029	.150	2.879	.004
	Type of organisation	-.053	.045	-.061	-1.184	.237
	CInfluence	.144	.043	.179	3.385	.001
	NPatterns	.202	.046	.231	4.416	.000

a. Dependent Variable: BelAboutEnviron

The Model 3 of table 32 also shows that gender also decreases beliefs about the environment but this time by 7%; which is not significant at p<.005 (significance is .264). For every change in age group, beliefs about the environment increases by 4.5%; which is not significant at p<.005 (significance is .361). For every increase in the level of education, beliefs about the environment increases by 8.4%; which is this time significant at p<.005 (significance is .004). The type of organisation one works for decreases beliefs about the environment by 5.3%; which is not significant at p<.005 (significance is .231). A change in cultural influence increases beliefs about the environment by 14.4%, which is significant at p<.005 (significance is .001). A change in normative patterns increases beliefs about the environment by 20.2%, which is significant at p<.001 (significance is .000).

These results also show that the demographics (gender, age group, and type of organisation) are not significant predictors of variability in beliefs about the environment. However, level of education was found a significant predictor of variability in beliefs about the environment.

Basing on these results; hypothesis H1a: Cultural influence has a positive effect on beliefs about the environment has been supported. Hypothesis H1b: Normative patterns have a positive effect on beliefs about the environment has been supported.

4.7.2.3 Regression model for the predictor variables and dependent variable

The direct relationship between predictor variables (societal structure, ICT education, ICT policies and Organisational structure) and the dependent variable (Green ICT practice) was modelled for objective 2; the results are presented in Table 33;

Table 33: Regression model summary and ANOVA for Predictor variables and Dependent variable

Model Summary[f] **ANOVA**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.150[a]	.022	.011	.72521	.022	2.044	4	357	.088	2.044	.088[b]
2	.409[b]	.167	.155	.67034	.145	61.839	1	356	.000	14.281	.000[c]
3	.515[c]	.265	.253	.63053	.098	47.381	1	355	.000	21.348	.000[d]
4	.540[d]	.292	.278	.61982	.027	13.368	1	354	.000	20.846	.000[e]
5	.573[e]	.329	.313	.60442	.037	19.267	1	353	.000	21.590	.000[f]

Model Summary

a. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies

e. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies, OrgStructure

f. Dependent Variable: GreenICTPractice

ANOVA

a. Dependent Variable: GreenICTPractice

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc

e. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies

f. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, SStructure, ICTEduc, ICTPolicies, OrgStructure

The results in Model 5 reveal that the type of organisation, age group, gender, level of education, societal structure, ICT education, ICT policies and organisational structure account for 32.9% of the variability in beliefs about the environment. The model is useful for predicting Green ICT practice with F-ratio (F) of 21.59 which is significant at $p<0.001$ (significance is .000). Despite the low coefficients of determination (r^2), the results of the assumptions looked well.

Table 34 presents the coefficients for the study variables;

Table 34: Coefficients results for Predictor variables and Mediator variable

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.202	.240		13.358	.000		
	Gender	-.133	.078	-.090	-1.700	.090	.980	1.020
	Age group	.060	.062	.053	.968	.333	.927	1.079
	Highest level of education	.022	.036	.034	.617	.537	.881	1.135
	Type of organisation	.123	.055	.121	2.224	.027	.920	1.086
2	(Constant)	1.495	.310		4.820	.000		
	Gender	-.063	.073	-.043	-.865	.388	.966	1.035
	Age group	.055	.057	.048	.961	.337	.927	1.079
	Highest level of education	.010	.033	.016	.314	.754	.879	1.138
	Type of organisation	.066	.052	.065	1.279	.202	.902	1.108
	SStructure	.456	.058	.386	7.864	.000	.969	1.032
3	(Constant)	1.171	.295		3.964	.000		
	Gender	-.061	.068	-.042	-.898	.370	.966	1.035
	Age group	.045	.054	.040	.846	.398	.926	1.079
	Highest level of education	.013	.031	.021	.424	.672	.879	1.138
	Type of organisation	.072	.049	.071	1.489	.137	.902	1.109
	SStructure	.280	.060	.237	4.651	.000	.794	1.259
	ICTEduc	.283	.041	.347	6.883	.000	.816	1.226
4	(Constant)	1.008	.294		3.429	.001		
	Gender	-.063	.067	-.043	-.940	.348	.966	1.036
	Age group	.052	.053	.046	.991	.323	.925	1.081
	Highest level of education	.004	.031	.007	.140	.889	.873	1.145
	Type of organisation	.069	.048	.068	1.450	.148	.902	1.109
	SStructure	.245	.060	.207	4.072	.000	.773	1.293
	ICTEduc	.249	.042	.305	5.994	.000	.774	1.292
	ICTPolicies	.150	.041	.175	3.656	.000	.870	1.149
5	(Constant)	.976	.287		3.404	.001		
	Gender	-.089	.066	-.060	-1.353	.177	.958	1.044
	Age group	.075	.052	.066	1.446	.149	.916	1.091

Highest level of education	-.005	.030	-.008	-.177	.859	.869	1.151
Type of organisation	.064	.047	.063	1.370	.172	.901	1.110
SStructure	.227	.059	.192	3.867	.000	.770	1.299
ICTEduc	.217	.041	.265	5.271	.000	.750	1.334
ICTPolicies	.069	.044	.081	1.575	.116	.719	1.391
OrgStructure	.165	.037	.227	4.389	.000	.708	1.412

a. Dependent Variable: GreenICTPractice

According to Model 5 table 34, A person's gender decreases Green ICT practice by 6%; and is not significant at p<.005 (significance is .177). VIF and Tolerance for gender is 1.04 and .958 respectively. For every change in age group, Green ICT practice increases by 6.6%; and is not significant at p<.005 (significance is .149). VIF and Tolerance for age group is 1.09 and .916 respectively. For every increase in the level of education, Green ICT practice reduces by 0.8%; which is not significant at p<.005 (significance is .859). VIF and Tolerance for level of education is 1.15 and .869 respectively. The type of organisation one works for increases Green ICT practice by 6.3%; which is not significant at p<.005 (significance is .172). VIF and Tolerance for type of organisation is 1.11 and .901 respectively.

Additionally, a change in societal structure increases Green ICT practice by 19.2%, which is significant at p<.001 (significance is .000). VIF and Tolerance for societal structure is 1.29 and .770 respectively. For every increase in ICT education, Green ICT practice increases by 26.5%; which is significant at p<.001 (significance is .000). VIF and Tolerance for ICT education is 1.33 and .750 respectively. A change in ICT policies increases Green ICT practice by 8.1%, but is not significant at p<.005 (significance is .116). VIF and Tolerance for societal structure is 1.39 and .719 respectively. Lastly, a change in organisational structure increases Green ICT practice by 22.7%, which is significant at p<.001 (significance is .000). VIF and Tolerance for societal structure is 1.41 and .708 respectively.

The results of Table 34 show that all the demographics (gender, age group, level of education and type of organisation) together with ICT policies are not significant

predictors of variability in Green ICT practice. VIF for all the predictor variables are below 10 and Tolerance is above 0.1. The average VIF for all the variables is 1.23 which is not significantly more than 1 meaning there is no cause for concern on collinearity; the variables were not strongly correlated.

Subsequently, according to the results; hypothesis H5: Societal structure has a positive effect on Green ICT practice has been supported. Hypothesis H6: ICT Education has a positive effect on Green ICT practice has been supported. Hypothesis H7: ICT policies have a positive effect on Green ICT practice has not been supported. Hypothesis H8: Organisational structure has a positive effect on Green ICT practice has been supported.

4.7.2.4 Regression model for the mediating variable and dependent variable

The mediation relationship between beliefs about the environment and Green ICT practice was also modelled in line with objective 4. The results are presented in table 35;

Table 35: Regression results for beliefs about the environment and Green ICT

Model Summary **ANOVA**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig.
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.150[a]	.022	.011	.72521	.022	2.044	4	357	.088	2.044	.088[b]
2	.374[b]	.140	.128	.68120	.117	48.628	1	356	.000	11.579	.000[c]
3	.467[c]	.219	.205	.65021	.079	35.738	1	355	.000	16.547	.000[d]
4	.539[d]	.290	.276	.62049	.072	35.818	1	354	.000	20.691	.000[e]
5	.563[e]	.316	.301	.60986	.026	13.459	1	353	.000	20.424	.000[f]
6	.587[f]	.345	.328	.59794	.028	15.208	1	352	.000	20.575	.000[g]

Model Summary

a. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure, ICTEduc

e. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure, ICTEduc, ICTPolicies

f. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure, ICTEduc, ICTPolicies, OrgStructure

e. Dependent Variable: GreenICTPractice

ANOVA

a. Dependent Variable: GreenICTPractice

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure

e. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure, ICTEduc

f. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure, ICTEduc, ICTPolicies

g. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, BelAboutEnviron, SStructure, ICTEduc, ICTPolicies, OrgStructure

The results in Model 6 show the type of organisation, age group, gender, level of education, beliefs about the environment, societal structure, ICT education, ICT policies and organisational structure account for 32.8% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 20.58 which is significant at $p<0.001$ (significance is .000). This model also has a low r^2 but was also estimated to analyse the relationships between variables to test the hypotheses.

Table 36 presents the coefficients for the mediator relationship between beliefs about the environment and Green ICT practice;

Table 36: Coefficient results for beliefs about the environment and Green ICT practice

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.202	.240		13.358	.000
	Gender	-.133	.078	-.090	-1.700	.090
	Age group	.060	.062	.053	.968	.333
	Highest level of education	.022	.036	.034	.617	.537
	Type of organisation	.123	.055	.121	2.224	.027
2	(Constant)	1.619	.320		5.062	.000
	Gender	-.083	.074	-.056	-1.127	.261
	Age group	.040	.058	.035	.683	.495
	Highest level of education	-.015	.034	-.023	-.427	.670
	Type of organisation	.128	.052	.126	2.464	.014
	BelAboutEnviron	.408	.059	.351	6.973	.000
3	(Constant)	.749	.338		2.215	.027
	Gender	-.043	.071	-.029	-.608	.543
	Age group	.042	.055	.037	.753	.452
	Highest level of education	-.013	.033	-.020	-.396	.693

	Type of organisation	.082	.050	.081	1.631	.104
	BelAboutEnviron	.287	.059	.247	4.836	.000
	SStructure	.358	.060	.303	5.978	.000
	(Constant)	.674	.323		2.087	.038
	Gender	-.047	.067	-.032	-.701	.484
	Age group	.037	.053	.033	.703	.483
4	Highest level of education	-.004	.031	-.006	-.124	.901
	Type of organisation	.083	.048	.082	1.732	.084
	BelAboutEnviron	.207	.058	.178	3.546	.000
	SStructure	.231	.061	.195	3.786	.000
	ICTEduc	.249	.042	.305	5.985	.000
	(Constant)	.519	.320		1.621	.106
	Gender	-.049	.066	-.033	-.743	.458
	Age group	.044	.052	.039	.847	.398
	Highest level of education	-.013	.031	-.019	-.406	.685
5	Type of organisation	.080	.047	.079	1.694	.091
	BelAboutEnviron	.204	.057	.175	3.559	.000
	SStructure	.196	.061	.166	3.233	.001
	ICTEduc	.216	.042	.264	5.145	.000
	ICTPolicies	.148	.040	.173	3.669	.000
	(Constant)	.577	.314		1.836	.067
	Gender	-.075	.065	-.051	-1.144	.253
	Age group	.065	.051	.058	1.278	.202
	Highest level of education	-.018	.030	-.028	-.601	.548
6	Type of organisation	.073	.046	.072	1.582	.115
	BelAboutEnviron	.168	.057	.144	2.949	.003
	SStructure	.189	.060	.160	3.177	.002
	ICTEduc	.193	.041	.236	4.650	.000
	ICTPolicies	.077	.044	.090	1.756	.080
	OrgStructure	.147	.038	.203	3.900	.000

a. Dependent Variable: GreenICTPractice

The results in Model 6 of table 36 reveal that gender decreases green ICT practice but this time by 7.5%; which is not significant at p<.005 (significance is .253). For every change in age group, green ICT practice increases by 6.5%; which is not significant at p<.005 (significance is .202). In a turn of events, for every increase in the level of education, green ICT practice decreases by 1.8%; and not significant at p<.005 (significance is .584). The type of organisation one works for on the other hand increases which by 7.3%; which is also not significant at p<.005 (significance is .115). A change in beliefs about the environment increases green ICT practice by 18.8%, and is significant at p<.005 (significance is .003). A change in societal structure increases green ICT practice by 18.9%, which is significant at p<.005 (significance is .002). A change in ICT education increases green ICT practice by 19.3%, which is significant at p<.001

(significance is .000). A change in ICT policies increases green ICT practice by 7.7%, which is not significant at p<.005 (significance is .080). A change in organisational structure increases green ICT practice by 14.7%, which is significant at p<.001 (significance is .000).

These results also show that all the demographics (gender, age group, type of organisation and level of education) and ICT policies are not significant predictors of variability in green ICT practice.

The results above therefore, reveal that hypothesis H13: Beliefs about the environment have a positive significant effect on Green ICT practice has been supported.

4.7.2.5 Regression model for the Beliefs, opportunities and dependent variable

Beliefs about the environment had three anchor points; beliefs, desires and opportunities. However, the factor analysis results revealed that desires didn't have items that were important and was therefore, dropped. Further, regression model was estimated for the constructs of beliefs and opportunities (beliefs about the environment) and green ICT practice. Table 37 presents the results;

Table 37: Regression results for beliefs, opportunities and Green ICT practice

	Model Summary									ANOVA	
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig.
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.150[a]	.022	.011	.72521	.022	2.044	4	357	.088	2.044	.088[b]
2	.296[b]	.088	.075	.70158	.065	25.462	1	356	.000	6.839	.000[c]
3	.389[c]	.151	.137	.67765	.064	26.587	1	355	.000	10.540	.000[d]

Model summary

a. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, Beliefs

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, Beliefs, Opportunities

ANOVA

a. Dependent Variable: GreenICTPractice

b. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education

c. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, Beliefs

d. Predictors: (Constant), What type of organisation do you work with, What is your age group, What is your gender, What is your highest level of education, Beliefs, Opportunities

The results in Model 3 show type of organisation, age group, gender and level of education, beliefs and opportunities account for 13.7% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 10.540 which is significant at $p<0.001$ (significance is .000).

The results of the coefficients for the relationship between beliefs and opportunities and Green ICT practice are presented in Table 38;

Table 38: Coefficient results for beliefs and opportunities and Green ICT practice

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	3.202	.240		13.358	.000		
	Gender	-.133	.078	-.090	-1.700	.090	.980	1.020
	Age group	.060	.062	.053	.968	.333	.927	1.079
	Highest level of education	.022	.036	.034	.617	.537	.881	1.135
	Type of organisation	.123	.055	.121	2.224	.027	.920	1.086
2	(Constant)	2.125	.315		6.747	.000		
	Gender	-.106	.076	-.072	-1.400	.163	.976	1.025
	Age group	.054	.060	.048	.910	.364	.927	1.079
	Highest level of education	-.007	.035	-.011	-.203	.840	.857	1.167
	Type of organisation	.134	.054	.132	2.503	.013	.919	1.088
	Beliefs	.274	.054	.261	5.046	.000	.955	1.047
3	(Constant)	1.644	.318		5.166	.000		
	Gender	-.077	.073	-.052	-1.056	.291	.970	1.031
	Age group	.032	.058	.029	.563	.574	.922	1.085
	Highest level of education	-.010	.034	-.016	-.295	.768	.857	1.167
	Type of organisation	.121	.052	.119	2.338	.020	.917	1.091
	Beliefs	.078	.065	.074	1.202	.230	.626	1.598
	Opportunities	.326	.063	.317	5.156	.000	.633	1.581

a. Dependent Variable: GreenICTPractice

The results in Model 3 of table 38 reveal that gender decreases green ICT practice but this time by 7.7%; which is not significant at p<.005 (significance is .291). VIF and Tolerance for gender is 1.03 and .970 respectively. For every change in age group, green ICT practice increases by 3.2%; which is not significant at p<.005 (significance is .574). VIF and Tolerance for age group is 1.09 and .922 respectively. For every increase in the level of education, green ICT practice decreases by 1%; and not significant at p<.005 (significance is .768). VIF and Tolerance for level of education is 1.17 and .857 respectively. The type of organisation one works for on the other hand increases which by 12.1%; which is not significant at p<.005 (significance is .020). VIF and Tolerance for type of organisation is 1.09 and .917 respectively. A change in beliefs increases green ICT practice by 7.8%, but is not significant at p<.005 (significance is .230). VIF and Tolerance for beliefs is 1.60 and .626 respectively. A change in opportunities increases green ICT practice by 32.6%, which is significant at p<.001 (significance is .000). VIF and Tolerance for opportunities is 1.58 and .633 respectively. All the variables have a VIF above 10

These results show that all the demographics (gender, age group, type of organisation and level of education) and desires are not significant predictors of variability in green ICT practice. Only opportunities were found to be a significant predictor of variability in green ICT practice. Also the collinearity results show that there is no collinearity between the items.

The results above therefore, show that hypothesis H13b: Hypothesis H5c: Opportunities have a positive significant effect on Green ICT practice has been supported. However, hypothesis H13a: Beliefs have a positive significant effect on Green ICT practice has not been supported. The items on the construct Desires were dropped during the EFA because they were not found important.

4.7.2.6 Regression model for the moderating variables

The conceptual framework has moderator variables (identifiability, evaluation and monitoring). These were used to test the moderating effect of these moderator variables on the relationship between beliefs about the environment and green ICT practice.

A regression model for the moderating effect of identifiability on the relationship between beliefs about the environment and green ICT practice was estimated. The results are presented in table 39;

Table 39: Regression results for identifiability, beliefs about the environment and green ICT practice

Model Summary **ANOVA**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig.
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.347[a]	.121	.118	.68490	.121	49.432	1	360	.000	49.432	.000[b]
2	.457[b]	.209	.204	.65064	.088	39.911	1	359	.000	47.343	.000[c]
3	.457[c]	.209	.202	.65150	.000	.049	1	358	.825	31.494	.000[d]

Model Summary

a. Predictors: (Constant), BelAboutEnviron

b. Predictors: (Constant), BelAboutEnviron, Identifiability

c. Predictors: (Constant), BelAboutEnviron, Identifiability, BID

ANOVA

a. Dependent Variable: GreenICTPractice

b. Predictors: (Constant), BelAboutEnviron

c. Predictors: (Constant), BelAboutEnviron, Identifiability

d. Predictors: (Constant), BelAboutEnviron, Identifiability, BID

The results of Model 3 show that beliefs about the environment and identifiabililty account for 20.4% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 47.343 which is significant at $p<0.001$ (significance is .000). The product of identifiability (BID) was calculated by multiplying mean of beliefs about the environment and mean of identifiability. The results show that beliefs about the environment, identifiabililty and product of identifiability account for 20.2% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 31.494 which is significant at $p<0.001$ (significance is .000).

The results of the coefficients for the moderating effect of identifiability in the relationship between beliefs about the environment and Green ICT practice are presented in Table 40;

Table 40: Coefficients for identifiability, beliefs about the environment and green ICT practice

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.814	.236		7.690	.000
	BelAboutEnviron	.404	.057	.347	7.031	.000
2	(Constant)	1.401	.233		6.002	.000
	BelAboutEnviron	.313	.056	.269	5.541	.000
	Identifiability	.254	.040	.307	6.317	.000
3	(Constant)	1.416	.243		5.830	.000
	BelAboutEnviron	.309	.059	.266	5.261	.000
	Identifiability	.254	.040	.307	6.310	.000
	BID	-.013	.060	-.011	-.221	.825

a. Dependent Variable: GreenICTPractice

The results in Model 3 of table 40 reveal that beliefs about the environment increases green ICT practice by 30.9%; and is significant at p<.001 (significance is .00). Identifiability increases green ICT practice by 25.4%; which is also significant at p<.001 (significance is .000). However, the product of identifiability decreases green ICT practice by 1.3%; and is not significant at p<.005 (significance is .825). This shows that the identifiability is not a significant predictor of variability in the relationship between beliefs about the environment and green ICT practice.

Secondly a regression model for the moderating effect of evaluation on the relationship between beliefs about the environment and green ICT practice was estimated. The results are presented in table 41;

Table 41: Regression results for Evaluation, beliefs about the environment and green ICT practice

Model Summary **ANOVA**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig.
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.347[a]	.121	.118	.68490	.121	49.432	1	360	.000	49.432	.000[b]
2	.452[b]	.204	.200	.65259	.083	37.531	1	359	.000	45.989	.000[c]
3	.456[c]	.208	.202	.65175	.004	1.921	1	358	.167	31.379	.000[d]

Model summary

a. Predictors: (Constant), BelAboutEnviron

b. Predictors: (Constant), BelAboutEnviron, Evaluation

c. Predictors: (Constant), BelAboutEnviron, Evaluation, BEVA

ANOVA

a. Dependent Variable: GreenICTPractice

b. Predictors: (Constant), BelAboutEnviron

c. Predictors: (Constant), BelAboutEnviron, Evaluation

d. Predictors: (Constant), BelAboutEnviron, Evaluation, BEVA

The results in Model 3 show that beliefs about the environment and evaluation account for 20% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 49.432 which is significant at $p<0.001$ (significance is .000). The product of evaluation (BEVA) was calculated by multiplying mean of beliefs about the environment and mean of evaluation. The results show that beliefs about the environment, evaluation and product of evaluation account for 20.2% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 31.379 which is significant at $p<0.001$ (significance is .000).

The results of the coefficients for the moderating effect of evaluation in the relationship between beliefs about the environment and Green ICT practice are presented in Table 42;

Table 42: Coefficients for evaluation, beliefs about the environment and green ICT practice

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.814	.236		7.690	.000
	BelAboutEnviron	.404	.057	.347	7.031	.000

2	(Constant)	1.296	.240		5.397	.000
	BelAboutEnviron	.355	.055	.306	6.426	.000
	Evaluation	.239	.039	.291	6.126	.000
3	(Constant)	1.273	.240		5.292	.000
	BelAboutEnviron	.371	.056	.319	6.582	.000
	Evaluation	.223	.041	.272	5.492	.000
	BEVA	.091	.066	.069	1.386	.167

a. Dependent Variable: GreenICTPractice

The results in model 3 of table 42 reveal that beliefs about the environment increases green ICT practice by 37.1%; and is significant at p<.001 (significance is .00). Evaluation increases green ICT practice by 22.3%; which is also significant at p<.001 (significance is .000). However, the product of evaluation increases green ICT practice by 9.1%; and is not significant at p<.005 (significance is .165). This shows that the evaluation is not a significant predictor of variability in the relationship between beliefs about the environment and green ICT practice.

Lastly a regression model for the moderating effect of monitoring on the relationship between beliefs about the environment and green ICT practice was estimated. The results are presented in table 43;

Table 43: Regression results for Evaluation, beliefs about the environment and green ICT practice

	Model Summary									ANOVA	
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					F	Sig.
					R Square Change	F Change	df1	df2	Sig. F Change		
1	.347[a]	.121	.118	.68490	.121	49.432	1	360	.000	49.432	.000[b]
2	.506[b]	.257	.252	.63067	.136	65.572	1	359	.000	61.935	.000[c]
3	.510[c]	.260	.254	.63007	.003	1.679	1	358	.196	41.928	.000[d]

Model summary

a. Predictors: (Constant), BelAboutEnviron

b. Predictors: (Constant), BelAboutEnviron, Monitoring

c. Predictors: (Constant), BelAboutEnviron, Monitoring, BMM

ANOVA

a. Dependent Variable: GreenICTPractice

b. Predictors: (Constant), BelAboutEnviron

c. Predictors: (Constant), BelAboutEnviron, Monitoring

d. Predictors: (Constant), BelAboutEnviron, Monitoring, BMM

The results in Model 3 show that beliefs about the environment and monitoring account for 25.2% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 61.935 which is significant at p<0.001 (significance is .000). The product of monitoring (BMM) was calculated by multiplying mean of beliefs about the environment and mean of monitoring. The results show that beliefs about the environment, monitoring and product of monitoring account for 25.4% of the variability in Green ICT practice. The model is useful for predicting green ICT practice with F-ratio (F) of 41.928 which is significant at p<0.001 (significance is .000).

The results of the coefficients for the moderating effect of evaluation in the relationship between beliefs about the environment and Green ICT practice are presented in Table 44;

Table 44: Coefficients for monitoring, beliefs about the environment and green ICT practice

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.814	.236		7.690	.000
	BelAboutEnviron	.404	.057	.347	7.031	.000
2	(Constant)	1.201	.230		5.218	.000
	BelAboutEnviron	.333	.054	.286	6.209	.000
	Monitoring	.311	.038	.374	8.098	.000
3	(Constant)	1.172	.231		5.075	.000
	BelAboutEnviron	.343	.054	.295	6.336	.000
	Monitoring	.304	.039	.366	7.863	.000
	BMM	.078	.060	.060	1.296	.196

a. Dependent Variable: GreenICTPractice

The results in Model 3 of table 44 reveal that beliefs about the environment increases green ICT practice by 34.3%; and is significant at p<.001 (significance is .00). Monitoring increases green ICT practice by 30.4%; which is also significant at p<.001 (significance is .000). However, the product of monitoring increases green ICT practice by 7.8%; and is not significant at p<.005 (significance is .196). This shows that the

evaluation is not a significant predictor of variability in the relationship between beliefs about the environment and green ICT practice.

4.7.3 Testing for Mediation

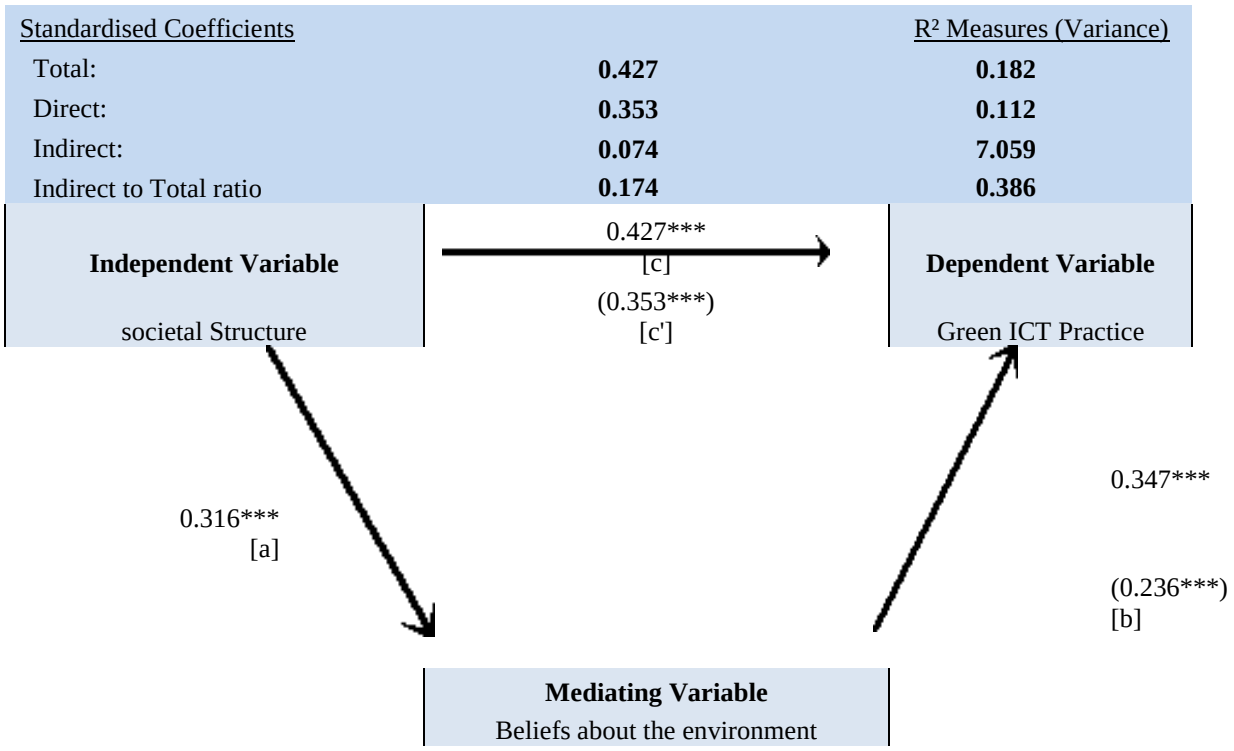
Tests were run to test the mediation effect of beliefs about the environment on the relationship between societal structure, ICT education, ICT policies, Organisational structure and Green ICT practice. Sobel tests were estimated and the Sobel z-value calculated using Medgraphs. To confirm mediation, the P value must be p<.05 (Baron & Kenny, 1986). The following MedGraphs present mediation results.

4.7.3.1. The mediating effect of beliefs about the environment on the relationship between societal structure, and Green ICT practice

There is a significant effect of beliefs about the environment on the relationship between societal structure and Green ICT practice with a Sobel z-value of 3.8322 and a significant level of p=.000127. At 95% Symmetrical Confidence interval, the lower bound is .03909 and higher bound is .12093. The standardized direct mediating effect of the relationship is .353 while the standardized indirect mediating effect is .074 with an indirect to total ratio of .174. Beliefs about the environment predict 38.6% of the relationship between societal structure and Green ICT practice (see Figure 17).

Figure 17: Medgraph of Beliefs about the environment on societal structure and Green ICT practice

Type of mediation		Significant		
Sobel z-value		3.8322	*p* =	0.000127
95% Symmetrical Confidence interval				
	Lower	**0.03909**		
	Higher	**0.12093**		
Unstandardized indirect effect				
	a*b	**0.08001**		
	Se	**0.02088**		
Effective Size measures				



4.7.3.2 The mediating effect of beliefs about the environment on the relationship between ICT education and Green ICT practice

There is a significant effect of beliefs about the environment on the relationship between ICT education and Green ICT practice with a Sobel z-value of 3.731829 and a significant level of p=.00019. At 95% Symmetrical Confidence interval, the lower bound is .02882 and higher bound is .09259. The standardized direct mediating effect of the relationship is .380 while the standardized indirect mediating effect is .074 with an Indirect to Total ratio of .163. Beliefs about the environment predict 38.1% of the relationship between ICT Education and Green ICT practice (see Figure 18).

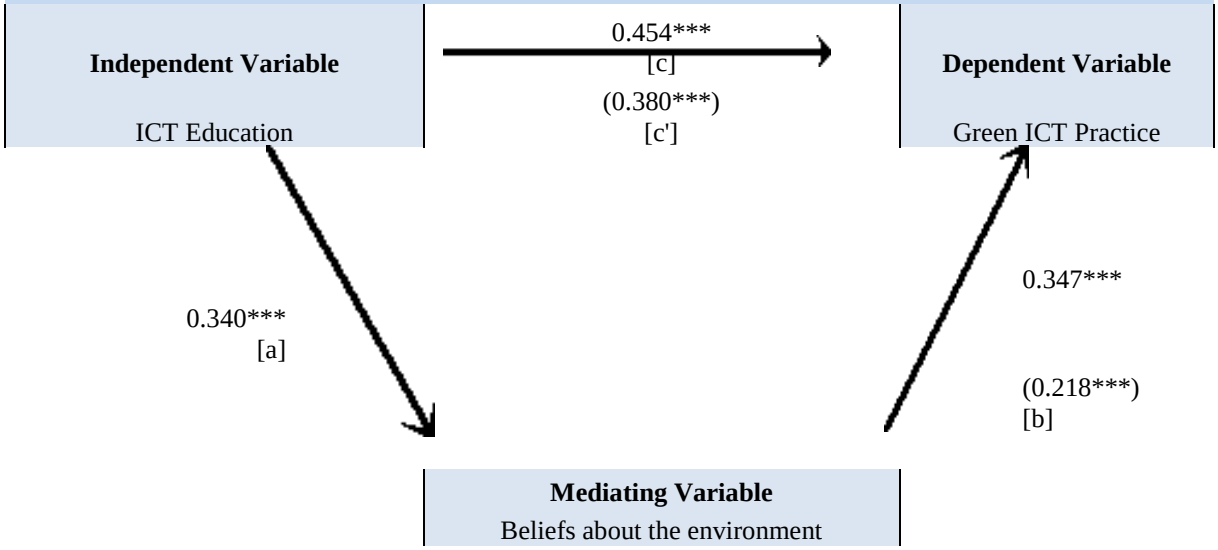
Figure 18: Medgraph of Beliefs about the environment on ICT Education and Green ICT practice

Type of mediation	Significant		
Sobel z-value	3.731829	*p* =	0.00019
95% Symmetrical Confidence interval			
Lower	**0.02882**		

	Higher	**0.09259**
Unstandardized indirect effect		
	a*b	**0.06071**
	Se	**0.01627**

Effective Size measures

Standardised Coefficients		R² Measures (Variance)
Total:	**0.454**	**0.206**
Direct:	**0.38**	**0.127**
Indirect:	**0.074**	**0.078**
Indirect to Total ratio	**0.163**	**0.381**

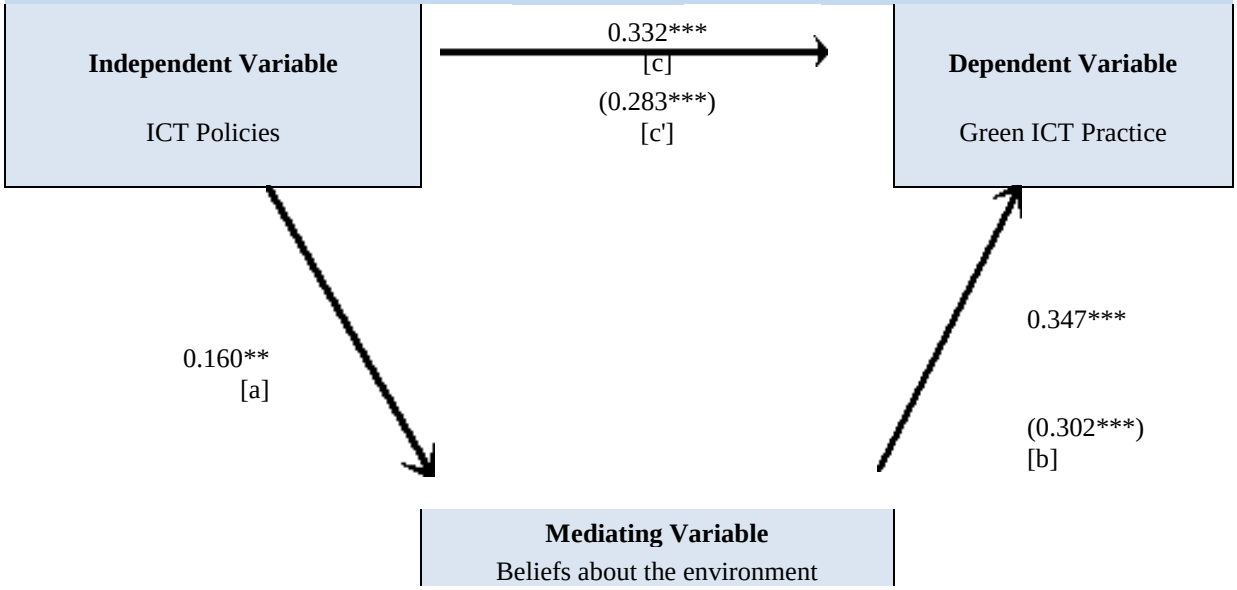


4.7.3.3 The mediating effect of beliefs about the environment on the relationship between ICT policies and Green ICT practice

There is a significant effect of beliefs about the environment on the relationship between ICT Policies and Green ICT practice with a Sobel z-value of 2.782503 and a significant level of p = 0.005394. At 95% Symmetrical Confidence interval, the lower bound is .01224 and higher bound is .07059. The standardized direct mediating effect of the relationship is .283 while the standardized indirect mediating effect is .048 with an Indirect to Total ratio of .145. Beliefs about the environment predict 28.5% of the relationship between ICT policies and Green ICT practice (see Figure 19).

Figure 19: Medgraph of Beliefs about the environment on ICT Policies and Green ICT practice

Type of mediation		Significant		
Sobel z-value		2.782503	*p* =	0.005394
95% Symmetrical Confidence interval				
	Lower	**0.01224**		
	Higher	**0.07059**		
Unstandardized indirect effect				
	a*b	**0.04142**		
	Se	**0.01489**		
Effective Size measures				
Standardised Coefficients			R^2 Measures (Variance)	
Total:		**0.332**	**0.109**	
Direct:		**0.283**	**0.078**	
Indirect:		**0.048**	**0.031**	
Indirect to Total ratio		**0.145**	**0.285**	



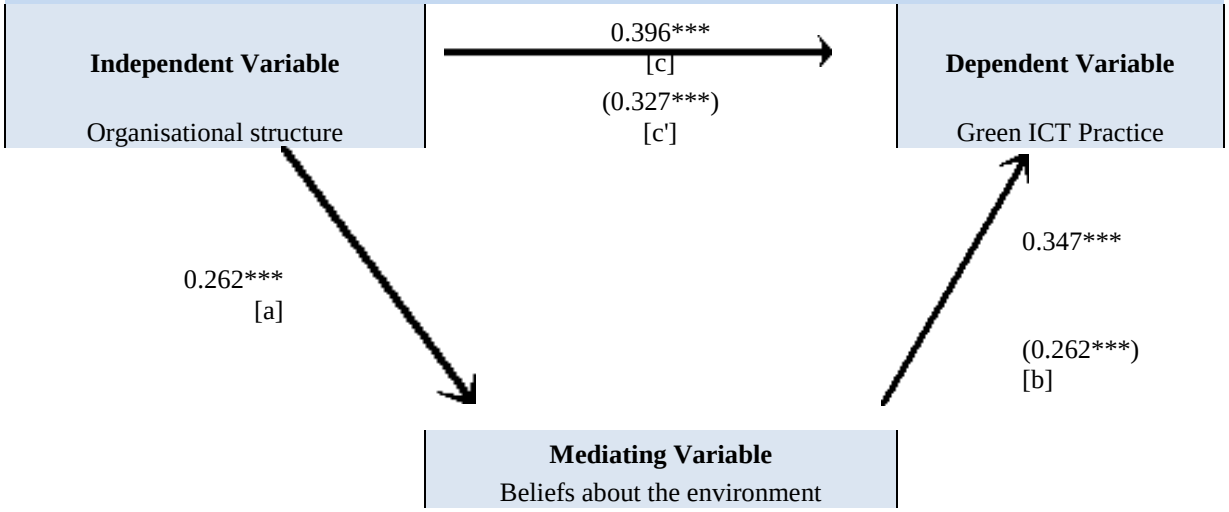
4.7.3.4 The mediating effect of beliefs about the environment on the relationship between Organisational structure, and Green ICT practice

There is a significant effect of beliefs about the environment on the relationship between Organisational structure and Green ICT practice with a Sobel z-value of 3.714556 and a significant level of p= .000204. At 95% Symmetrical Confidence interval, the lower bound is .02341 and higher bound is .0757. The standardized direct mediating effect of the relationship is .327 while the standardized indirect mediating effect is .068 with an

Indirect to Total ratio of .173. Beliefs about the environment predict 36.2% of the relationship between organisational structure and Green ICT practice (see Figure 20);

Figure 20: Medgraph of Beliefs about the environment on Organisational structure and Green ICT practice

Type of mediation		Significant		
Sobel z-value		3.714556	*p* =	0.000204
95% Symmetrical Confidence interval				
	Lower	**0.02341**		
	Higher	**0.0757**		
Unstandardized indirect effect				
	a*b	**0.04955**		
	Se	**0.01334**		
Effective Size measures				
Standardised Coefficients			R² Measures (Variance)	
Total:		**0.396**	**0.156**	
Direct:		**0.327**	**0.099**	
Indirect:		**0.068**	**0.056**	
Indirect to Total ratio		**0.173**	**0.362**	



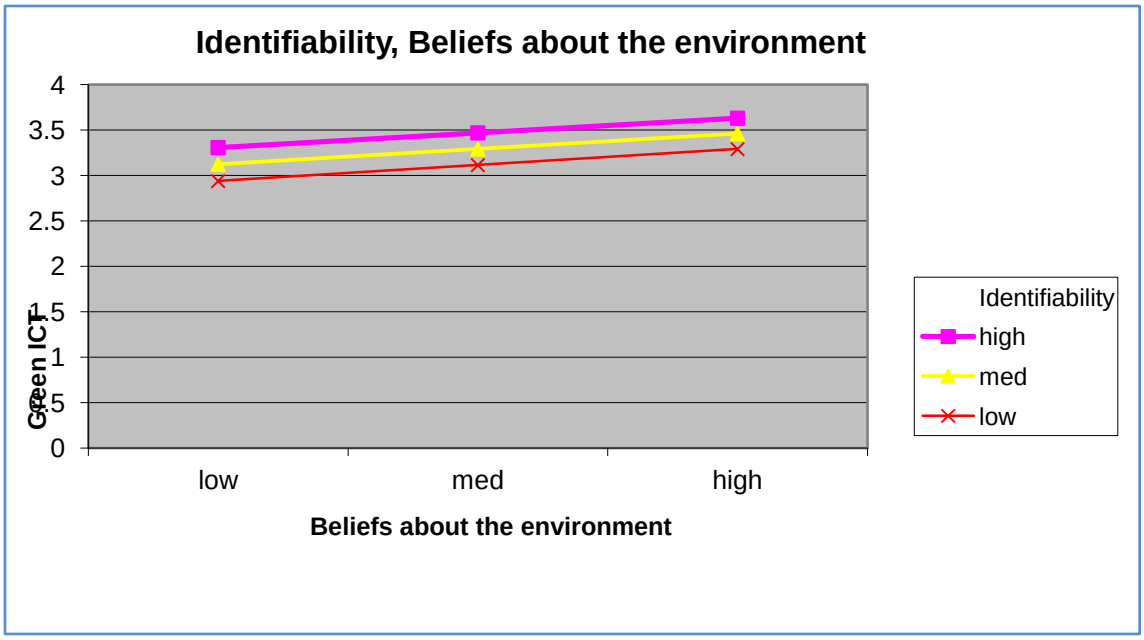
4.7.4 Testing for Moderation

MODgraphs were estimated to confirm moderation effects of identifiability, evaluation and monitoring on the relationship between beliefs about the environment and Green ICT practice. The lines of the MODgraph should meet to show moderation between variables.

4.7.4.1 Moderation effect of identifiability on the relationship between beliefs about the environment and Green ICT practice

The MODgraph for identifiability is presented in figure 21;

Figure 21: MODgraph of Identifiability and beliefs about the environment

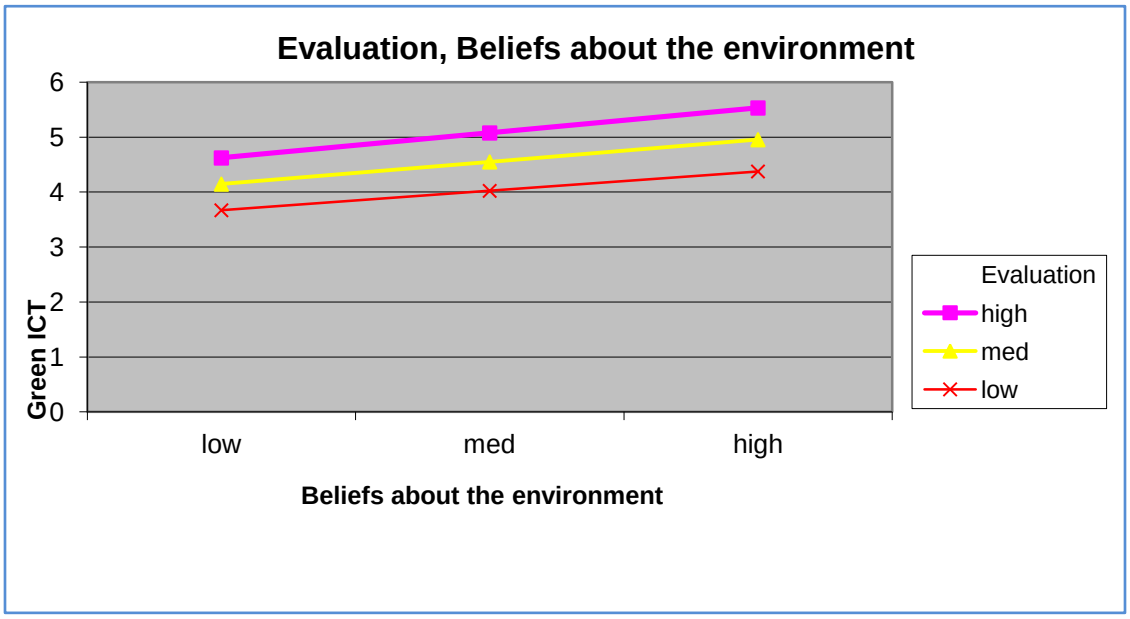


The lines of MODgraph for identifiability and beliefs about the environment do not meet meaning that there is no moderation between the variables. Basing on the results of both the regression model and MODgraph the hypothesis H14 that states that; Identifiability has a positive effect on the relationship between beliefs about the environment and Green ICT has not been supported.

4.7.4.2 Moderation effect of Evaluation on the relationship between beliefs about the environment and Green ICT practice

The MODgraph for evaluation is presented in figure 22;

Figure 22: MODgraph of evaluation and beliefs about the environment

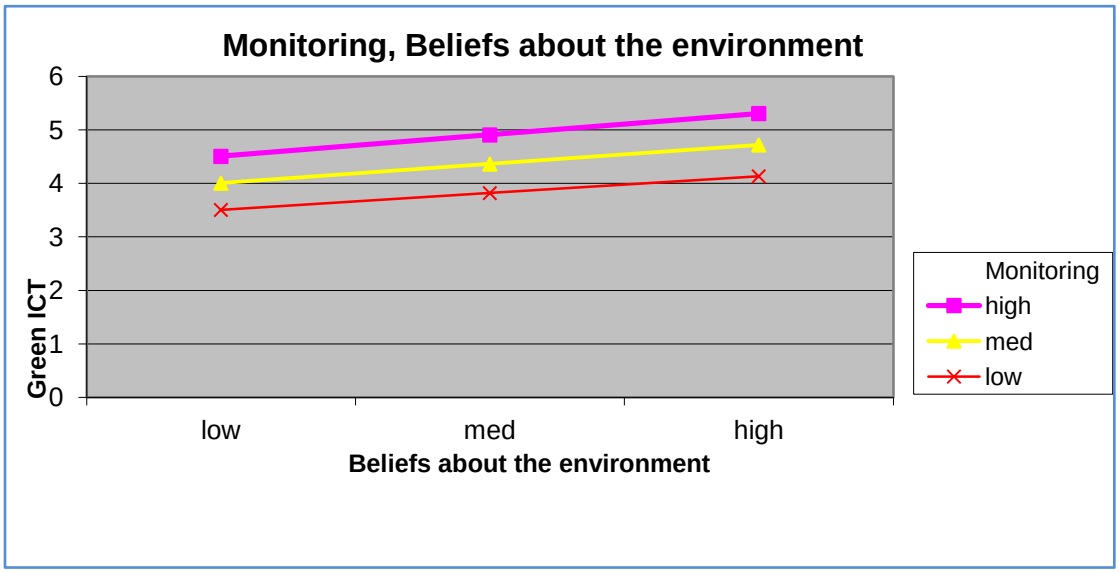


The lines of MODgraph for evaluation and beliefs about the environment also do not meet meaning that evaluation there is no moderation between the two variables. Basing on the results of both the regression model and MODgraph the hypothesis H15; Expectation of evaluation has a positive effect on the relationship between beliefs about the environment and Green ICT has not been supported.

4.7.4.3 Moderation effect of Monitoring on the relationship between beliefs about the environment and Green ICT practice

The MODgraph for monitoring is presented in figure 23;

Figure 23: Modgraph of Monitoring and Beliefs about the environment



The lines of MODgraph for monitoring and beliefs about the environment also do not meet meaning that there is no moderation between the two variables. Basing on the results of both the regression model and MODgraph the hypothesis H16; Awareness of monitoring has a positive effect on the relationship between beliefs about the environment and Green ICT has also not been supported.

Basing on the regression results, medgraphs and modgraphs above, the Table 45 shows the hypotheses that have been supported and not supported;

Table 45: Results of the hypotheses

Research objective	**Hypotheses**		**Confirmation**
1. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on beliefs about the environment in Uganda.	H1	Societal structure has a positive significant effect on beliefs about the environment.	Supported
	H1a	Cultural influence has a positive effect on beliefs about the environment.	Supported
	H1b	Normative patterns have a positive	Supported

		effect on beliefs about the environment.	
	H2	ICT education has a positive significant effect on beliefs about the environment.	Supported
	H3	ICT policy has a positive significant effect on beliefs about the environment.	Not supported
	H4	Organisational structure has a positive significant effect on beliefs about the environment.	Supported
2. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on Green ICT practice in Uganda.	H5	Societal structure has a positive significant effect on Green ICT practice.	Supported
	H6	ICT education has a positive significant effect on Green ICT practice.	Supported
	H7	ICT policies have a positive effect on Green ICT practice	Supported
	H8	Organisational structure has a positive significant effect on Green ICT practice.	Supported
3. To examine the mediating effect of beliefs about the environment on the relationship between societal structure, ICT education, ICT policies, organisational structure and Green ICT in	H9	Beliefs about the environment positively mediate the relationship between societal structure and Green ICT practice.	Supported
	H10	Beliefs about the environment positively mediate the relationship between ICT Education and Green ICT practice.	Supported
	H11	Beliefs about the environment	Supported

practice in Uganda		positively mediate the relationship between ICT policies and Green ICT practice.	
	H12	Beliefs about the environment positively mediate the relationship between organisational structure and Green ICT practice.	Supported
4. To establish the effect of beliefs about the environment on Green ICT practice in Uganda.	H13	Beliefs about the environment have a positive significant effect on Green ICT practice.	Supported
	H13a	Beliefs have a positive significant effect on Green ICT practice.	Not supported
	H13c	Opportunities have a positive significant effect on Green ICT practice.	Supported
5. To assess the moderating effect of identifiability, expectation of evaluation and awareness of monitoring on the relationship between beliefs about the environment and Green ICT practice in Uganda.	H14	Identifiability positively moderates the relationship between beliefs about the environment and Green ICT.	Not supported
	H15	Expectation of evaluation positively moderates the relationship between beliefs about the environment and Green ICT.	Not supported
	H16	Awareness of monitoring positively moderates the relationship between beliefs about the environment and Green ICT.	Not supported

4.8 Structural Model Estimation

Structural equation modeling (SEM) was done to establish whether the overall model is acceptable. The fit indices establish whether the model is acceptable. If the model is acceptable, significance of specific paths is established. This study estimated and tested

two main hypothesized models; the mediated and the moderated effect models of Green ICT practice.

4.8.1 Testing for Validity of the Hypothesized Models

The first SEM was estimated to test for mediation as hypothesized by research questions 1 to 4 and hypotheses 1 to 12. One of the objectives of the study was to examine the mediating effect of beliefs about the environment on the relationship between societal structure, ICT education, ICT policies, organisational structure and Green ICT in practice in Uganda. Both full and partial mediation were tested in order to confirm and select the most superior model in order to draw meaningful conclusions. The two models are presented in Figure 24 and Figure 25 for full mediation and partial mediation respectively;

Figure 24: Full Mediation Effects Model

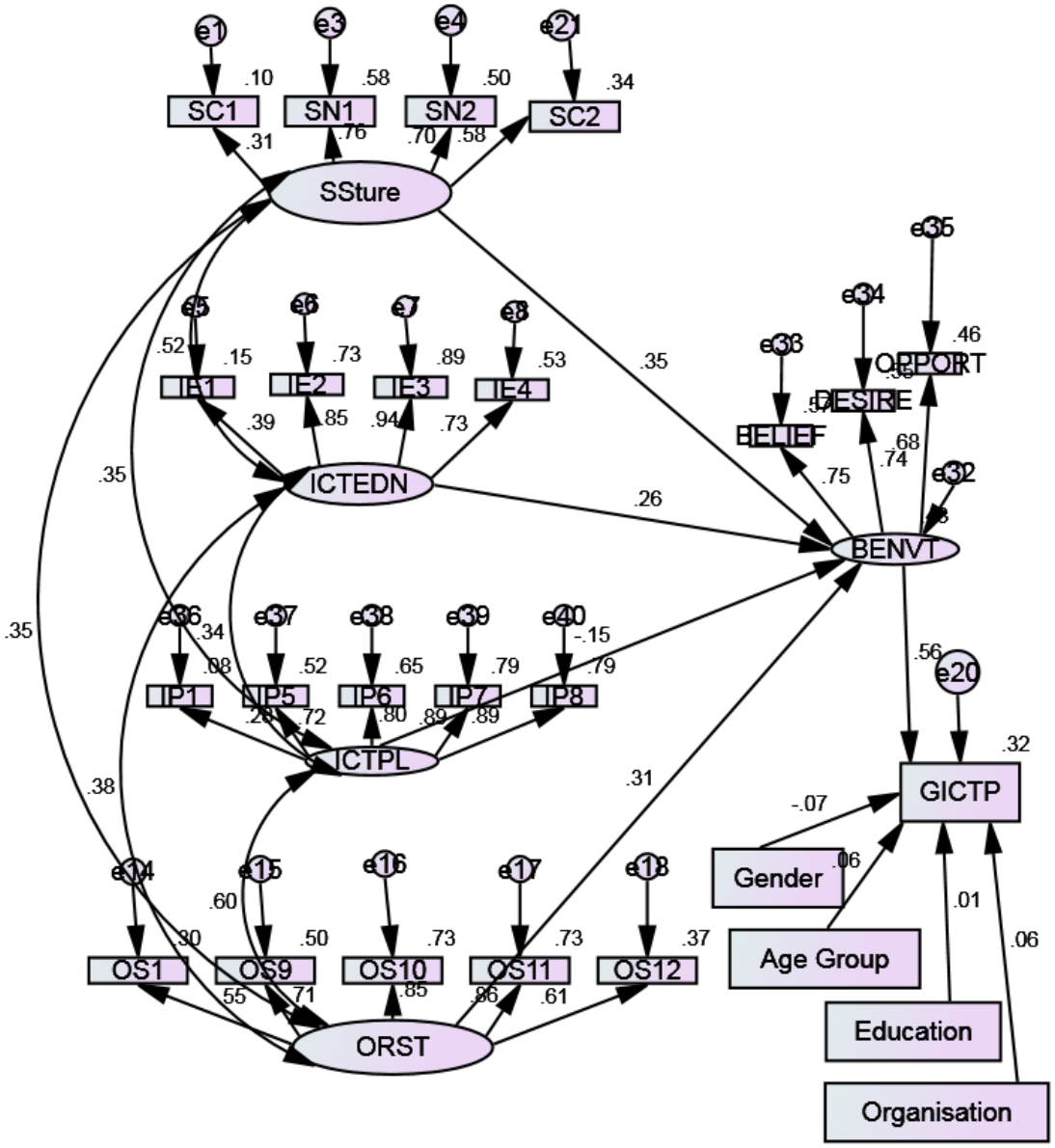
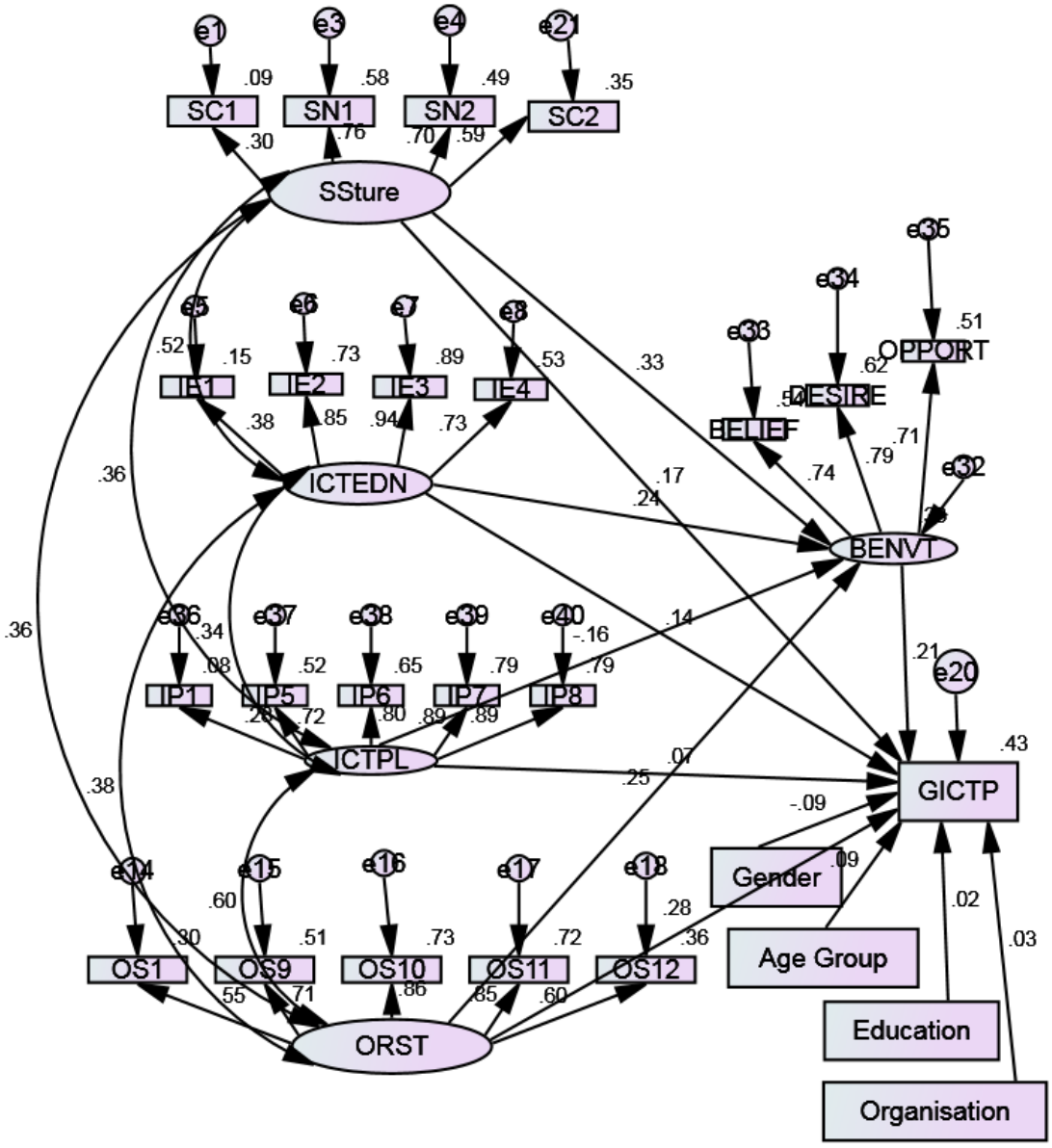


Figure 25: Partial Mediation Effects Model



The model fit summary in Table 46 shows that full mediation generated a chi-square of 929.274 at P=.000 for 289 degrees of freedom and χ^2/df of 3.215. It also has GFI of .83, AGFI of .803, NFI of .802, RFI of .81, IFI of .84, TLI of .82, CFI of .84 and RMSEA of .08. All these measures of goodness of fit indices indicate that the model fit is unacceptable. On the other side partial mediation generated a chi-square of 849.695 at P=.000 for 289 degrees of freedom and χ^2/df of 2.981. It has GFI of .842, AGFI of .805,

NFI of .801, RFI of .773, IFI of .858, TLI of .837, CFI of .857 and RMSEA of .07. Basing on χ^2/df and RMSEA, the partial mediation model is an improved fit however, further modifications were done on the partially mediated model (see Figure 28 of the Final SEM).

Table 46: SEM Estimates for Mediation

			Full Mediation			Partial Mediation			Hypotheses
			B	**β**	**P**	**B**	**B**	**P**	
BENVT	<---	SSture	.747	.355	***	.705	.333	.001	H1 – Supported
BENVT	<---	ICTEDN	.389	.258	***	.352	.238	.002	H2 – Supported
BENVT	<---	ORST	.273	.311	***	.211	.247	.002	H4 – Supported
BENVT	<---	ICTPL	-.224	-.145	.056	-.241	-.161	.045	H3 – Supported
GICTP	<---	BENVT	.728	.558	***	.286	.213	***	H13- Supported
GICTP	<---	Gender	-.098	-.067	.141	-.129	-.087	.032	
GICTP	<---	Agegroup	.067	.059	.190	.098	.086	.033	
GICTP	<---	Education	.004	.007	.880	.014	.022	.587	
GICTP	<---	Organisation	.060	.059	.190	.027	.026	.519	
GICTP	<---	SSture				.497	.175	.018	H5 – Supported
GICTP	<---	ICTEDN				.279	.140	.017	H6 – Supported
GICTP	<---	ICTPL				.146	.072	.233	H7 – Not Supported
GICTP	<---	ORST				.319	.277	***	H8 – Supported

Model	**χ^2**	**χ2/df**	**DF**	**P**	**GFI**	**AGFI**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**
Full	929.274	3.215	289	.000	.830	.803	.802	.810	.840	.820	.840	.08
Partial	849.695	2.981	285	.000	.842	.805	.801	.773	.858	.837	.857	.07

The hypothesized model also had moderating effects for the objective; to assess the moderating effect of identifiability, expectation of evaluation and awareness of monitoring on the relationship between beliefs about the environment and Green ICT practice in Uganda. These correspond with hypotheses 13 to 15. Again full and partial moderation models were estimated and tested; the models are presented in figure 26 and figure 27 for full moderation and partial moderation respectively;

Figure 26: Full Moderation Effects Model

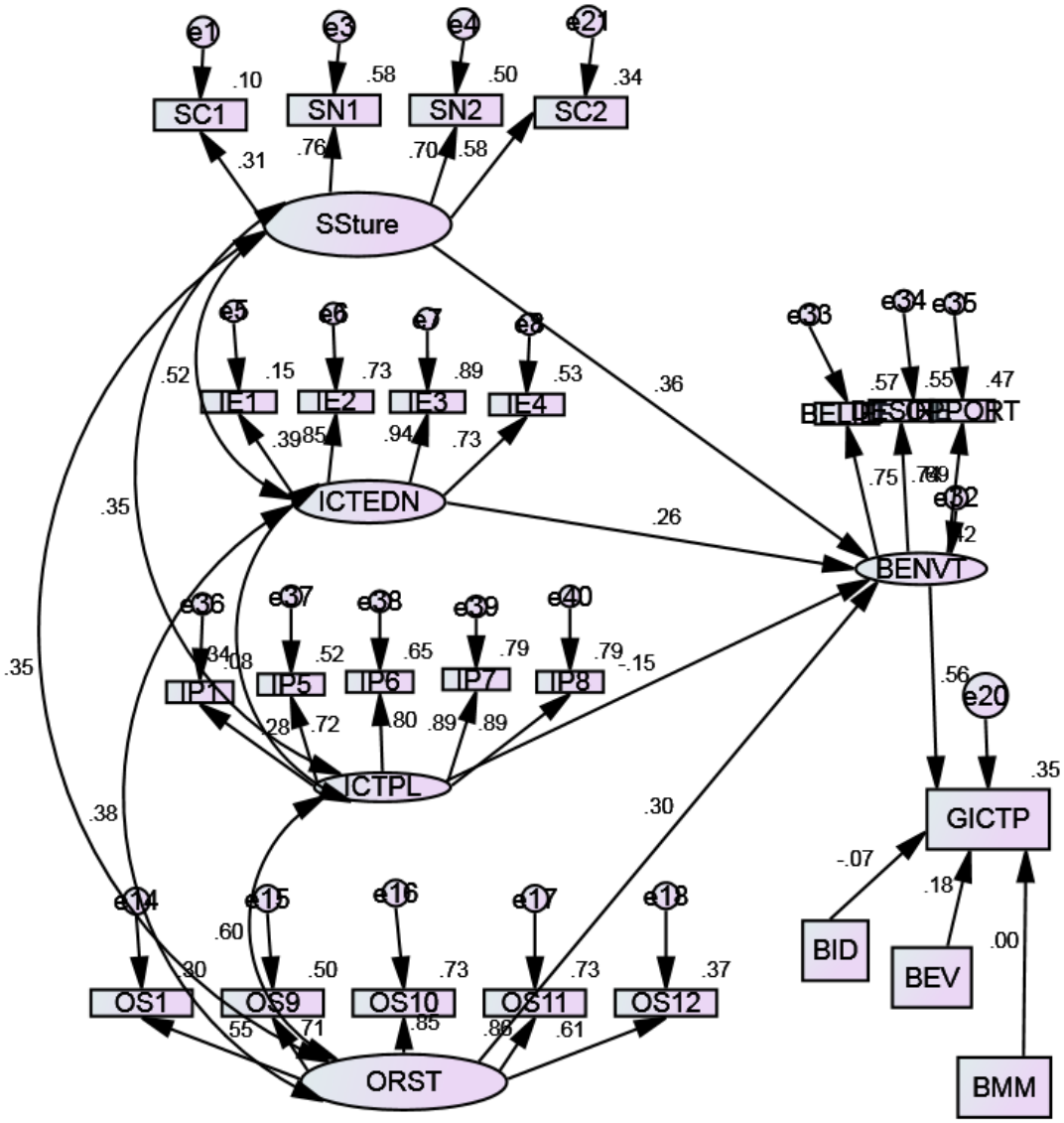
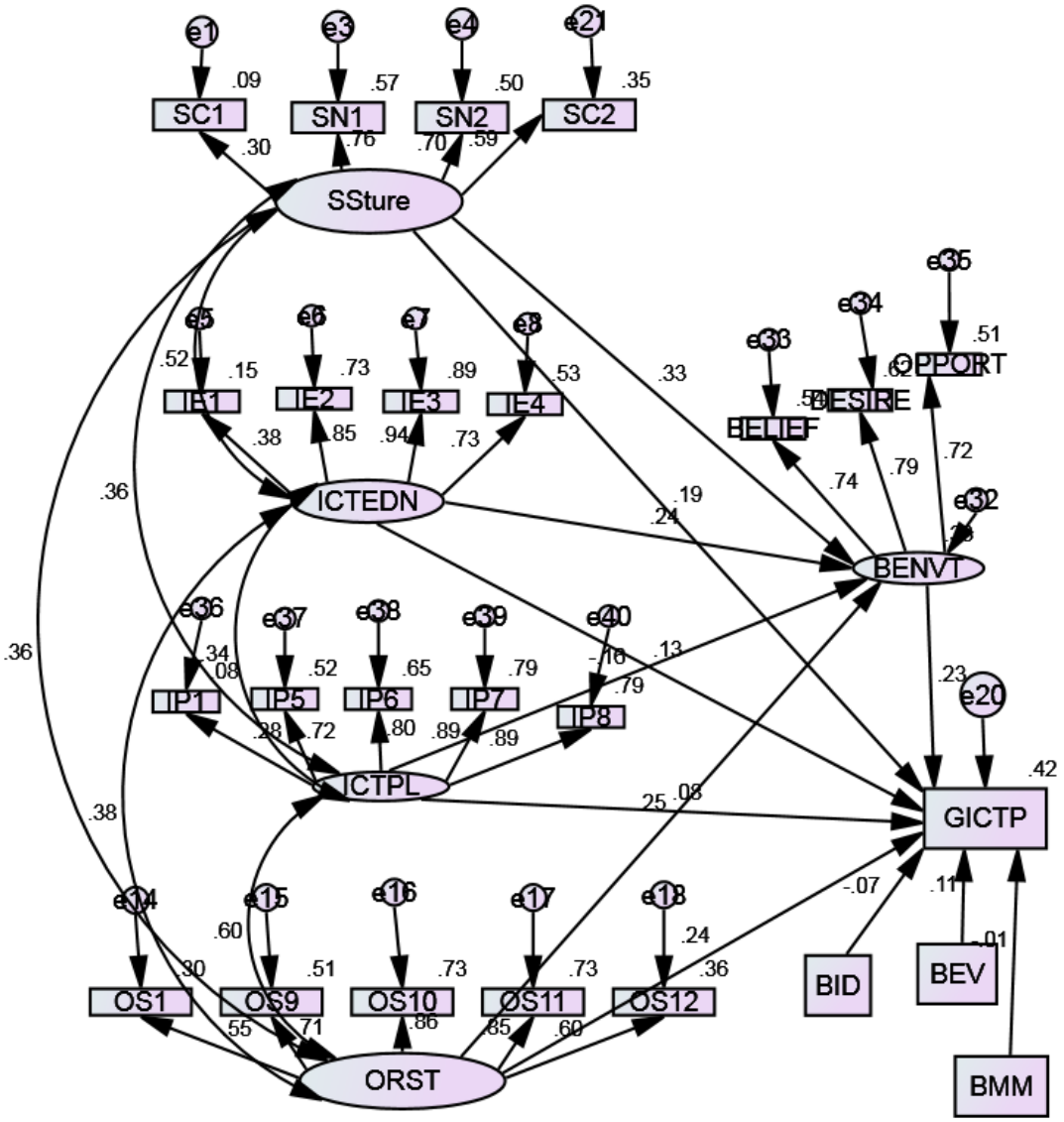


Figure 27: Partial Moderation Effects Model



The model fit summary in table 47 shows that full moderation generated a chi-square of 1341.333 at P=.000 for 265 degrees of freedom and χ^2/df of 5.062. It also has GFI of .775, AGFI of .724, NFI of .714, RFI of .676, IFI of .757, TLI of .722, CFI of .755 and RMSEA of .11. Again all these measures of goodness of fit indices indicate that the model fit is unacceptable. In comparison, the partial mediation generated a chi-square of 1273.621 at P=.000 for 261 degrees of freedom and χ^2/df of 4.880. It has GFI of .785, AGFI of .733, NFI of .728, RFI of .688, IFI of .771, TLI of .735, CFI of .769 and

RMSEA of .10. Even though the partial mediation model has an improved fit it is also not acceptable basing on its goodness of fit. These moderation models have a worse goodness of fit indices than the mediation models therefore, further modifications were done on the partially mediated model to get the final Model (see figure 28).

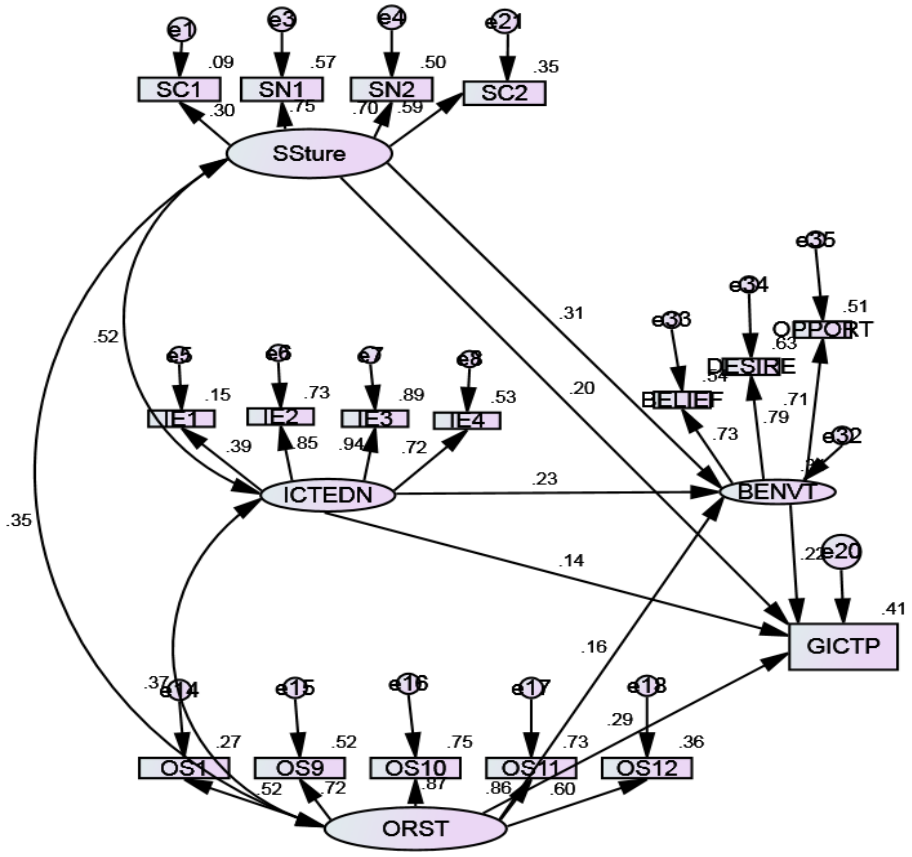
Table 47: SEM Estimates for Moderation

			Full Moderation			Partial Moderation			Hypotheses
			B	**B**	**P**	**B**	**β**	**P**	
BENVT	<---	SSture	.752	.358	***	.351	.238	.002	H1 – Supported
BENVT	<---	ICTEDN	.383	.255	***	-.242	-.162	.045	H2 – Supported
BENVT	<---	ORST	.265	.302	***	.212	.247	.002	H4 – Supported
BENVT	<---	ICTPL	-.224	-.146	.056	.705	.333	.001	H3 – Supported
GICTP	<---	BENVT	.740	.559	***	.307	.229	***	H13 – Supported
GICTP	<---	ICTEDN				.252	.128	.031	H6 – Supported
GICTP	<---	ICTPL				.152	.076	.219	H7 – Not Supported
GICTP	<---	ORST				.277	.242	***	H8 – Supported
GICTP	<---	SSture				.527	.186	.014	H5 – Supported
GICTP	<---	BID	-.081	-.066	.135	-.087	-.072	.082	H14 – Not Supported
GICTP	<---	BEV	.240	.179	***	.141	.106	.010	H15– Supported
GICTP	<---	BMM	-.004	-.003	.946	-.011	-.008	.837	H16 – Not Supported

Model	**χ^2**	**χ^2/df**	**DF**	**P**	**GFI**	**AGFI**	**NFI**	**RFI**	**IFI**	**TLI**	**CFI**	**RMSEA**
Full	1341.333	5.062	265	.000	.775	.724	.714	.676	.757	.722	.755	.11
Partial	1273.621	4.880	261	.000	.785	.733	.728	.688	.771	.735	.769	.10

Due to the poor model fit of both the initial mediation and the moderation models, further modifications to the hypothesized partially mediated and moderated models were conducted in order to get an acceptable model. Figure 28 shows the final accepted model.

Figure 28: Final SEM



The model fit summary in table 48 shows a goodness fit indices that are all acceptable except the P. Partial moderation without ICT policies that was found not a significant predictor of the changes in Green ICT practice generated a chi-square of 316.905 at P=.000 for 110 degrees of freedom and χ^2/df of 2.881. According to Schumacker and Lomax (2004), a χ^2/df less than 5 is acceptable. It also has GFI of .905, AGFI of .910, NFI of .901, RFI of .903, IFI of .919, TLI of .910, CFI of .918 and RMSEA of .07. This shows that the model is fit because GFI, IFI, RFI, TLI are all above .9 while NFI and CFI are both close to 1. RMSEA is .07 which is less than .08, therefore, also indicating fitness of the model.

Table 48: SEM Estimates for the Final Model

			B	S.E.	C.R.	β	P
BENVT	<---	SSture	.655	.205	3.199	.314	.001
BENVT	<---	ICTEDN	.330	.112	2.931	.225	.003
BENVT	<---	ORST	.145	.059	2.466	.160	.014
GICTP	<---	BENVT	.290	.083	3.519	.215	***
GICTP	<---	SSture	.573	.214	2.678	.204	.007
GICTP	<---	ICTEDN	.284	.118	2.399	.144	.016
GICTP	<---	ORST	.357	.070	5.089	.291	***

Model	χ^2	χ^2/df	DF	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
Final	316.905	2.881	110	.000	.905	.910	.901	.903	.919	.910	.918	.07

4.8.2 Cross Validation of Hypothesized Models

Five hypothesized models were estimated and tested namely; full mediation model with demographics, partial mediation model with demographics, full moderation model, partial moderation model and a partial mediation model without demographics and ICT policies. From these five models, the ones with the best model fits were the partial moderation model with demographics and the partial mediation model without demographics and ICT policies. In the first partial mediation model, ICT policies were found to have a significant effect on beliefs about the environment with P=.045 (at p<.05). However, ICT policies were not found to have a significant effect on Green ICT practice with P= .233 (at p<.05). Further modifications were done on the first partial mediation model and ICT policies were found not significant on beliefs about the environment as well. It also had weak estimates that were affecting the model and as a result, it was removed to establish a better model fit. Comparison between the first partial mediation and the final mediation reveals that there is a significant improvement in the goodness of fit indices. According to table 49, the final model has a better CMIN (χ^2), χ^2/df, GFI, AGFI, NFI, RFI, IFI, TLI and CFI even though they both have an acceptable RMSEA (.07). This indicates that the final partial mediation model is a better and more accurate representation of the data. Using average variance explained, the ability of the first partial mediation model to explain the variance in the mediator variable (beliefs about the environment) is R^2=33% and criterion variable (Green ICT practice) is R^2=43% compared to R^2=31% for the mediator variable and 41% for the criterion variable for the

final model. However, basing on Parsimonious Normed Fit Index (PNFI) the first partial mediation model has PNFI of .702 while the final partial mediation model has PNFI of .713 meaning the final model is more parsimonious. Using the percentage of hypothesized significant paths, the first partial mediation had nine direct paths of which five (56%) were significant at (P<.01), three (33%) were significant at (P<.05) while one (11%) was not significant (at P<.05). In comparison the final model has seven direct paths of which five (71%) were found to be significant at (P<.01) and the other two (29%) significant at (P<.05) therefore, a more powerful model. There is also a big reduction of χ^2 to 316.905 in the final model. Therefore, basing on the percentage of hypothesized significant paths, PNFI, χ^2 the final partial mediation model is a better model to represent the data.

Table 49: Cross validation of Goodness of fit indices

Model	χ^2	χ^2/df	DF	P	GFI	AGFI	NFI	RFI	IFI	TLI	CFI	RMSEA
First	849.695	2.981	285	.000	.842	.805	.801	.773	.858	.837	.857	.07
Final	316.905	2.881	110	.000	.905	.910	.901	.903	.919	.910	.918	.07

4.8.3 Estimation of Direct and Indirect Effects of the Mediation Model

Direct and indirect effects of the first partial mediation model were used to draw support for hypotheses H1 to H13 to enable proper interpretation of data (Field, 2009). The null hypothesis that "there is no difference between total and direct effects" was tested in order to draw conclusions on mediation. Table 50 shows that the independent variables (societal structure, ICT education, ICT policies and organisational structure) had direct effects on both beliefs about the environment and Green ICT practice.

According to table 50, societal structure, ICT education, ICT policies and organisational structure have a direct effect on Green ICT practice. Green ICT practice significantly increases by .27 units at P<.001 as organisational structure increases by one unit. Hypothesis H8 - Organisational structure has a positive effect on Green ICT practice is confirmed. Green ICT practice significantly increases by .18 units at P<.05 as societal

structure increases by one unit. This confirms hypothesis H5 that Societal structure has a positive significant effect on Green ICT practice. Green ICT practice significantly increases by .14 units at P<.05 as ICT education increases by one unit. This confirms hypothesis H6 that ICT education has a positive significant effect on Green ICT practice. The effect of ICT policies on Green ICT practice is positive but not significant (β =.07, p=.233). Therefore, hypothesis H7 that ICT policies have a positive effect on Green ICT practice is not supported. The effect of beliefs about the environment was also tested. The results indicate that Beliefs about the environment have a positive significant effect on Green ICT practice. Green ICT practice significantly increases by .21 units at P<.001 as beliefs about the environment increase by one unit. This confirms hypothesis H13, that Beliefs about the environment have a positive significant effect on Green ICT practice. On the premise of the results above, hypotheses H5, H6, H8, and H13 are supported while hypothesis H7 is not supported.

The results of table 50 further reveal that societal structure, ICT education, ICT policies and organisational structure have a direct effect on beliefs about the environment. Beliefs about the environment significantly increase by .33 units at P<.01 as societal structure increases by one unit. This confirms hypothesis H1 that Societal structure has a positive significant effect on beliefs about the environment. Beliefs about the environment significantly increase by .25 units at P<.05 as organisational structure increases by one unit. This confirms hypothesis H4 that Organisational structure has a positive significant effect on beliefs about the environment. Beliefs about the environment significantly increase by .24 units at P<.05 as ICT education increases by one unit. This confirms hypothesis H2 that ICT education has a positive significant effect on beliefs about the environment. Lastly beliefs about the environment significantly decrease by .16 units at P<.05 as ICT policies increase by one unit. This confirms hypothesis H3 that ICT policy has a positive significant effect on beliefs about the environment. On the premise of the results above, hypotheses H1, H2, H3, and H4 are supported.

The partially mediated model accounts for 33% of the variance in beliefs about the environment and 43% of the variance in Green ICT practice (see figure 25). Societal structure has the greatest effect on beliefs about the environment while organisational structure has the greatest effect on Green ICT practice. ICT policies do not have a significant effect on Green ICT practice.

Table 50: Direct Path Estimates for the Partially Mediated Model

			B	S.E.	C.R.	β	P
BENVT	<---	SSture	.705	.214	3.290	.333	.001
BENVT	<---	ICTEDN	.352	.114	3.079	.238	.002
BENVT	<---	ORST	.211	.068	3.095	.247	.002
BENVT	<---	ICTPL	-.241	.120	-2.004	-.161	.045
GICTP	<---	BENVT	.286	.082	3.480	.213	***
GICTP	<---	SSture	.497	.209	2.375	.175	.018
GICTP	<---	ICTEDN	.279	.117	2.390	.140	.017
GICTP	<---	ICTPL	.146	.122	1.193	.072	.233
GICTP	<---	ORST	.319	.076	4.208	.277	***

Table 51 gives a further analysis of the relationship among total, direct and indirect effects to test hypotheses H9 to H12. The results show that societal structure, ICT education, ICT policies and organisational structure have direct effects on both beliefs about the environment and Green ICT practice and also indirect effects on Green ICT practice through beliefs about the environment. The effect of beliefs about the environment is negative in the relationship between ICT policies and Green ICT practice; therefore, GICTP reduces by .03 units as the effect of ICTP on BENVT increases by 1 unit. The effect of beliefs about the environment is positive in the relationships between ICT education, organisational structure, societal structure and Green ICT practice. GICTP practice increases by .05, .05 and .07 units respectively as the effect of ICTE, OS and SS on BENVT increase by 1 unit. A comparison between the total and direct effects further confirms the results. The results reveal that total effects are greater than direct effects except for ICT policies where direct effects are greater than total effects leading to the rejection of the null hypothesis that 'total and direct effects are equal'. The results are further in line with the expectation that total effects should be greater than direct effects to achieve a positive indirect impact on the criterion variable.

Table 51: Total, Direct and Indirect Effects for the Partially Mediated Model

Standardized Total Effects	ICTPL	ORST	ICTEDN	SSture	BENVT
BENVT	-.161	.247	.238	.333	.000
GICTP	.038	.330	.191	.246	.213
Standardized Direct Effects	ICTPL	ORST	ICTEDN	SSture	BENVT
BENVT	-.161	.247	.238	.333	.000
GICTP	.072	.277	.140	.175	.213
Standardized Indirect Effects	ICTPL	ORST	ICTEDN	SSture	BENVT
BENVT	.000	.000	.000	.000	.000
GICTP	-.034	.053	.051	.071	.000

Source: Primary data

These results in Table 51 confirm hypothesis H9, H10, and H12 that Beliefs about the environment positively mediate the relationship between societal structure, ICT education, organisational structure and Green ICT practice. However, hypothesis H12 that states that Beliefs about the environment positively mediate the relationship between ICT policies and Green ICT practice has not been supported.

The results of Table 51 and variances in Table 52 for variances (e32 and e20) enable the generation of two structural equations that can be used to determine predicted values of criterion variables using observed values of the predictor variables. In this study the structural model has two criterion/endogenous variables namely beliefs about the environment (Y_{BENVT}) and Green ICT practice (Y_{GICTP}) and four predictor/exogenous variables namely societal structure (X_1), ICT education (X_2), ICT policies (X_3) and organisational structure (X_4).

The values of BENVT can be estimated using observed values of SS (X_1), ICTE (X_2), ICTP (X_3) and OS (X_4) as in the equation 2;

$$Y_{BENVT} = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + e32$$

Equation 2: BENVT mediated equation

$Y_{BENVT} = .33X_1 + .24X_2 - .16X_3 + .25X_4 + .21$

Values of Green ICT practice can also be determined using observed values of BENVT and the predictor variables (X_1 to X_4) as follows;

$Y_{GICTP} = \beta_5(BENVT) + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + e20$

$Y_{GICTP} = .21(BENVT) + .18X_1 + .14X_2 + .07X_3 + .28X_4 + .30$

Since BENVT is also a criterion variable and determined through equation 2, this equation can be substituted here as;

$Y_{GICTP} = .21(.33X_1 + .24X_2 - .16X_3 + .25X_4 + .21) + .18X_1 + .14X_2 + .07X_3 + .28X_4 + .30$

$Y_{GICTP} = (.07X_1 + .18X_1) + (.05X_2 + .14X_2) + (-.03X_3 + .07X_3) + (.05X_4 + .28X_4) + .30$

Equation 3: GICTP mediated equation

$Y_{GICTP} = .25X_1 + .19X_2 + .04X_3 + .33X_4 + .30$

Table 52: Covariances, correlations and variances for partially mediated model

			Covariance	S.E.	C.R.	P	Correlation
SSture	<-->	ICTEDN	.049	.013	3.776	***	.518
ICTEDN	<-->	ORST	.088	.020	4.436	***	.377
SSture	<-->	ORST	.058	.016	3.578	***	.355
ICTEDN	<-->	ICTPL	.045	.013	3.445	***	.340
ORST	<-->	ICTPL	.138	.032	4.266	***	.601
SSture	<-->	ICTPL	.033	.011	3.075	.002	.356

Variances in partially Mediation Model				
	Estimate	**S.E.**	**C.R.**	**P**
SSture	.07	.025	2.584	.010
ICTEDN	.14	.037	3.653	***
ORST	.40	.075	5.392	***
ICTPL	.13	.051	2.584	.010
e32	.21	.029	6.741	***
e20	.30	.024	12.660	***

4.8.4 Testing for Mediation using Bootstrap Significance

The indirect effect of beliefs about the environment on Green ICT practice was analysed using bootstrapping to confirm mediation (Preacher & Hayes, 2004). This was done to further test hypotheses H9, H10, H11 and H12. Using Bootstrap ML (Maximum Likelihood) method, with 2000 re-samples of the 362 replaced from the original set of 362 observations at a 95% confidence interval. The results present the estimates, standard error (SE), p-value at 95% confidence interval by determining the 2.5% (lower bounds) and 97.5% values (upper bounds) in the distribution of the total, direct and indirect effect estimates (see Table 53).

Table 53: Bootstrap Significance Test Results for Mediation

Standardised Total Effects					
Variable	**Estimate**	**SE**	**P-Value**	**Lower Bound**	**Upper Bound**
ICTPL	0.044	0.073	0.524	-0.106	0.188
ORST	.304**	0.072	0.001	0.158	0.444
ICTEDN	.189*	0.069	0.011	0.052	0.32
SSture	.263**	0.081	0.002	0.109	0.423
BENVT	.228**	0.075	0.002	0.092	0.385
Standardised Direct Effects					
ICTPL	0.081	0.071	0.248	-0.066	0.22
ORST	.247**	0.067	0.002	0.113	0.378
ICTEDN	.135*	0.064	0.038	0.008	0.265
SSture	.187*	0.087	0.015	0.031	0.363
BENVT	.228**	0.075	0.002	0.092	0.385
Standardised Indirect Effects					
ICTPL	-.037*	0.021	0.023	-0.092	-0.005
ORST	.056**	0.029	0.005	0.014	0.136
ICTEDN	.054*	0.028	0.01	0.01	0.123
SSture	.076**	0.033	0.001	0.028	0.166

According to the results in Table 53 the direct relationship between ICT Policies and Green ICT practice is not significant at 0.05 (p=0.25) with a beta of .081. The mediating (indirect) effect of Beliefs about the environment in the relationship between ICT policies and Green ICT practice is significant at 0.05 (p=0.023) however, with a beta of -.037. Likewise, the mediating effect of Beliefs about the environment in the relationship

between organisational structure, ICT education, societal structure and Green ICT practice are all significant at .005, .01 and .001 respectively with beta estimate of .056, .054 and .076 respectively. This implies that H9, H10 and H12 are supported. Hypothesis H11 on the other hand was not supported because of the negative beta value while the study hypothesized a positive relationship.

4.8.5 Estimation of Moderation Effects

To interpret data and draw support for hypotheses H14 to H16, direct effects of the partial moderation model were used. The same null hypothesis that "there is no difference between total and direct effects" was tested in order to draw the conclusions. Table 54 shows that the predictor variables (societal structure, ICT education, ICT policies and organisational structure) have a direct effect on both beliefs about the environment and Green ICT practice. Additionally, moderator variables (Identifiability, Evaluation and Monitoring) have a direct effect on the relationship between beliefs about the environment and Green ICT practice.

The results of Table 54 further reveal that identifiability, evaluation and monitoring have a direct effect on Green ICT practice. Green ICT practice reduces by .07 units as identifiability increases by one unit but is not significant at P<.05. Therefore, hypothesis H14 which states that identifiability positively moderates the relationship between beliefs about the environment and Green ICT is not supported. Green ICT practice significantly increase by .11 units at P<.05 as evaluation increases by one unit. This confirms hypothesis H15 that expectation of evaluation positively moderates the relationship between beliefs about the environment and Green ICT practice. Green ICT practice reduces by .01 units as monitoring increases by one unit but is not significant at P<.05. As a result hypothesis H16 that Awareness of monitoring positively moderates the relationship between beliefs about the environment and Green ICT practice.

The results in Table 54 also show that societal structure, ICT education, ICT policies and organisational structure have a direct effect on Green ICT practice. Green ICT practice significantly increases by .24 units at P<.001 as organisational structure increases by one unit. This also supports hypothesis H8 that Organisational structure has a positive effect on Green ICT practice is confirmed like it was in the mediation model. Green ICT practice significantly increases by .19 units at P<.05 as societal structure increases by one unit. This confirms hypothesis H5 that Societal structure has a positive significant effect on Green ICT practice. Green ICT practice significantly increases by .13 units at P<.05 as ICT education increases by one unit. This confirms hypothesis H6 that ICT education has a positive significant effect on Green ICT practice. The effect of ICT policies on Green ICT practice is again positive but not significant (β =.08, p=.219). Therefore, hypothesis H7 that ICT policies have a positive effect on Green ICT practice is not supported. The results indicate that Beliefs about the environment have a positive significant effect on Green ICT practice. Green ICT practice significantly increases by .23 units at P<.001 as beliefs about the environment increase by one unit. Like it was in the mediation model, this confirms hypothesis H13 that Beliefs about the environment have a positive significant effect on Green ICT practice. Consequently hypotheses H5, H6, H8, and H13 are supported while hypothesis H7 is not supported; which is line with the mediation model.

The partially moderated model accounts for 33% of the variance in beliefs about the environment and 42% of the variance in Green ICT practice (see Figure 27). Only evaluation was found to have a significant effect on the relationship between beliefs about the environment and Green ICT practice. Identifiability and monitoring do not have significant effects on Green ICT practice.

Table 54: Direct Path Estimates for the Partially Moderated Model

		B	S.E.	C.R.	β	P
BENVT	<--- ICTEDN	.351	.114	3.074	.238	.002
BENVT	<--- ICTPL	-.242	.120	-2.008	-.162	.045
BENVT	<--- ORST	.212	.068	3.098	.247	.002
BENVT	<--- SSture	.705	.214	3.287	.333	.001

			B	S.E.	C.R.	β	P
GICTP	<---	BENVT	.307	.083	3.682	.229	***
GICTP	<---	ICTEDN	.252	.117	2.158	.128	.031
GICTP	<---	BID	-.087	.050	-1.740	-.072	.082
GICTP	<---	BEV	.141	.055	2.575	.106	.010
GICTP	<---	ICTPL	.152	.123	1.230	.076	.219
GICTP	<---	BMM	-.011	.054	-.206	-.008	.837
GICTP	<---	ORST	.277	.075	3.680	.242	***
GICTP	<---	SSture	.527	.213	2.468	.186	.014

4.9 Summary of findings

This study sought to test 21 hypotheses. Table 55 presents a summary of the results of the hypotheses tested.

Table 55: Summary of findings

Research Objective	Hypotheses		β	P	Finding
1. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on beliefs about the environment in Uganda.	H1	Societal structure has a positive significant effect on beliefs about the environment.	.333	.001	Supported
	H1a	Cultural influence has a positive effect on beliefs about the environment.	.702	***	Supported
	H1b	Normative patterns have a positive effect on beliefs about the environment.	.588	***	Supported
	H2	ICT education has a positive significant effect on beliefs about the environment.	.238	.002	Supported
	H3	ICT policy has a positive significant effect on beliefs about the environment.	-.161	.045	Not Supported
	H4	Organisational structure has a	.247	.002	Supported

		positive significant effect on beliefs about the environment.			
2. To establish the influence of ICT education, ICT policies, societal structure and organisational structure on Green ICT practice in Uganda.	H5	Societal structure has a positive significant effect on Green ICT practice.	.175	.018	Supported
	H6	ICT education has a positive significant effect on Green ICT practice.	.140	.017	Supported
	H7	ICT policies have a positive effect on Green ICT practice	.072	.233	Not Supported
	H8	Organisational structure has a positive significant effect on Green ICT practice.	.277	***	Supported
3. To examine the mediating effect of beliefs about the environment on the relationship between societal structure, ICT education, ICT policies, organisational structure and Green ICT practice in Uganda.	H9	Beliefs about the environment positively mediate the relationship between societal structure and Green ICT practice.	.076	0.001	Supported
	H10	Beliefs about the environment positively mediate the relationship between ICT Education and Green ICT practice.	.054	0.01	Supported
	H11	Beliefs about the environment positively mediate the relationship between ICT policies and Green ICT practice.	-.037	.023	Not Supported
	H12	Beliefs about the environment positively mediate the relationship between organisational structure and Green ICT practice.	.056	0.005	Supported

4. To establish the effect of beliefs about the environment on Green ICT practice in Uganda.	H 13	Beliefs about the environment have a positive significant effect on Green ICT practice.	.213	***	Supported
	H13a	Beliefs have a positive significant effect on Green ICT practice.	.736	.230	Not supported
	H13c	Opportunities have a positive significant effect on Green ICT practice.	.713	***	Supported
5. To assess the moderating effect of identifiability, expectation of evaluation and awareness of monitoring on the relationship between beliefs about the environment and Green ICT practice in Uganda.	H14	Identifiability positively moderates the relationship between beliefs about the environment and Green ICT.	-.072	.082	Not Supported
	H15	Expectation of evaluation positively moderates the relationship between beliefs about the environment and Green ICT.	.106	.010	Supported
	H16	Awareness of monitoring positively moderates the relationship between beliefs about the environment and Green ICT.	-.008	.837	Not Supported

According to the results in Table 55, hypotheses H1, H1a, H1b, H2, H4, H5, H6, H8, H9, H10, H11, H12, H13, H13c and H15 are empirically supported. On the other hand hypotheses H3, H7, H13a, H13b, H14, H16 are not empirically supported.

4.10 Chapter conclusion

This chapter dealt with exploratory analysis to ensure the data are clean and normally distributed. The tests that were run included checking for outliers, factor analysis, normality using skewness and kurtosis, P-P plots, Q-Q plots and histograms, linearity using linear scatter plots, linear multiple regression and correlation, multicollinearity and homogeneity of variance. The data were found to have a normal distribution. A total of 362 questionnaires were found usable and cleaned for further analysis.

This chapter also presented and interpreted the findings of the study in line with the research objectives and hypotheses. The main output is the results of the correlation, regression, Medgraphs, Modgraphs and SEM with bootstrapping.

CHAPTER FIVE

DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 Introduction

The main purpose of the study was to investigate the effect of ICT education and ICT policies on Green ICT practice in Uganda. Constructs from the Belief Action Outcome model; the effect of societal structure and organisational structure on beliefs about the environment and some constructs of the Accountability theory; identifiability, expectation of evaluation and awareness of monitoring were also analysed. This chapter discusses the results in chapter four. The results are discussed in line with extant literature, theoretical and empirical explanations.

5.2 Discussion of findings

5.2.1 Societal structure, beliefs about the environment and Green IT practice

The first hypothesis (H1) was, societal structure has a positive significant effect on beliefs about the environment. The fifth hypothesis (H5) was, societal structure has a positive significant effect on Green ICT practice. Hypothesis H9 states that Beliefs about the environment positively mediate the relationship between societal structure and Green ICT practice. These hypotheses were compared to the observed models to test for any significant difference. Societal structure was measured using two constructs; cultural influence and normative patterns. From these constructs, hypothesis H1a that states that cultural influence has a positive effect on beliefs about the environment and hypothesis H1b that states that normative patterns have a positive effect on beliefs about the environment were formulated. The outcome of societal structure is expected to be a better performance of society and natural environment. This was measured on an individual level and not organisational level.

The content validity for the items for societal structure was .83 which is above the recommended S-CVI/Ave of .80 (Polit & Beck, 2006). Reliability of the same variable

was .83 which is also above the threshold of .7 (Cronbach 1951; Nunnally, 1987). The AVE of societal structure was .51 with a discriminant validity of .467. These confirm generalisability of the measurement scale of societal structure.

The results of the observed model of societal structure and beliefs about the environment established that societal structure has a positive effect on beliefs about the environment with a path coefficient of .333 and significance of p=.001, thereby agreeing with H1. On the other hand, the results of the observed model of societal structure and Green IT practice established a path coefficient of .175 and significance of p=.018. This is also in support of hypothesis H5. Lastly, the results of the observed model of the mediating effect of beliefs about the environment on the relationship between societal structure and Green IT practice established a path coefficient of .076 and significance of .001; which is also in support of hypothesis H9. These findings are in line with studies of Gholami et al. (2013), Melville (2010), Mithas et al. (2010) and Molla et al. (2014) who found positive relationships between societal structure and beliefs about the environment.

Further, the regression analysis showed that societal structure explains 11% of the variance in beliefs about the environment; with cultural influence contributing the highest variance of 6.6% and normative patterns contributing 4.6%. Societal structure explains 14.5% of the variance in Green IT practice. The effect of beliefs about the environment on the relationship between societal structure and Green ICT practice was found significant with a significant level of p=.000127 and Sobel z-value of 3.8322. Beliefs about the environment predict 38.6% of the relationship between societal structure and Green ICT practice.

The impact of ICT on the environment has been ignored because the positives outweigh the negatives (Berhout & Hertin, 2001). This is exacerbated in the low developed countries such as Uganda that are just beginning to tap into ICT4D. However, among the variables measured in this study that affect beliefs about the environment and Green IT practice, societal structure explains the highest variances. This may be attributed to

cultural context of the Ugandan people who fall under the high context (Gamsriegler, 2005; Hall, 1976) where people prefer to do things communally as opposed to individually. Hence the high influence of cultural influence and normative patterns. However, it should be noted that most of the communal environmental conservation drives require a certain level of economic growth. Uganda, being a low developed country grappling with financial shortages may be an explanation of the perceived low impact of societal structure on beliefs about the environment and on Green IT practice. The study by Wang et al. (2013) also found that the economic-development of a country or organisation also affects Green IT initiatives. They posit that the implementation of Green ICT differs according to whether the economy is developed or emerging. Therefore, even though societal structure has the highest effect on Green ICT in Uganda, most of the communal Green ICT projects may be difficult to fund.

5.2.2 ICT Education, beliefs about the environment and Green ICT practice

The second hypothesis (H2) was, ICT education has a positive significant effect on beliefs about the environment. The sixth hypothesis (H6) was, ICT education has a positive significant effect on Green ICT practice. While hypothesis H10 is, Beliefs about the environment positively mediate the relationship between ICT Education and Green ICT practice. These were also compared to the observed models to test for any significant differences. The role of education in fostering environmental sustainability has been supported by many authors (Figueredo & Tsarenko, 2013; Jain et al., 2013; Mishra et al., 2012; Wabobwa et al., 2013a; Wabobwa et al., 2013b; Wabobwa et al., 2012; Wang et al., 2013). ICT education was as a result adopted in the conceptual model for this study to measure its effect on beliefs about the environment and its ultimate effect on Green ICT practice.

The content validity for the items for ICT Education was 1.00; above the recommended S-CVI/Ave of .80 (Polit & Beck, 2006). Reliability of the same variable was .88 which is also above the threshold of .7 (Cronbach 1951; Nunnally, 1987). The AVE of ICT

education was .57. These also confirm that the measurement scale of ICT education can be generalised because construct validity and reliability were confirmed.

The results of the observed model of ICT education and beliefs about the environment established that ICT education has a positive effect on beliefs about the environment with a path coefficient of .238 which was found significant at p=.002, thereby agreeing with H2. Further, the observed model of ICT education and Green ICT practice established that ICT education has a positive effect on Green ICT practice with a path coefficient of .140 and significance of p=.017, thereby also agreeing with hypothesis H6. The path coefficient for the observed model of the mediating effect of beliefs about the environment on the relationship between ICT education and Green IT practice was established as .054 which was significant at p=.01. This therefore, also supports hypothesis H10. Previous studies have established the importance of education in environmental sustainability. Notable among the studies are work by Mishra et al. (2012) whose focus was on the curriculum of Green IT in universities. Wabobwa et al. (2013a) found a positive relationship between a person's education and their willingness to adopt Green IT. The UN, in its Millennium Development Goals (MDGs) emphasized the role of universities, education and training in achieving sustainability (Adu et al., 2014; Jain et al., 2013).

Regression results revealed that ICT education explains 4.5% of the variance in beliefs about the environment. ICT education explains 9.8% of the variance in Green IT practice. The effect of beliefs about the environment on the relationship between ICT Education and Green ICT practice was found significant with a significant level of p=.00019 and Sobel z-value of 3.731829. Beliefs about the environment predict 38.1% of the relationship between ICT education and Green ICT practice.

The low effect of ICT education on beliefs about the environment can be attributed to the fact that most universities have not incorporate sustainability in their curriculum. The findings of this study reveal that 42% of the respondents had been made aware of Green

IT in the ICT courses they did compared to 45% who were not made aware and 13% who were not sure. This means there is still a low awareness of Green IT and this can be potentially bridged through incorporating it in ICT education. Studies conducted by Andreopoulou (2012) and Watson et al. (2010) also indicate that there is very low participation of the IS academia in Green IT. Watson et al. (2010) made a call to the academia to include environmental sustainability content in courses to develop graduates with environmental sustainability awareness. Figueredo and Tsarenko (2013) state that learning that doesn't cause a mind shift towards the abuse of the environment is a failure. Therefore, it is imperative that environmental sustainability be included in the learning process to enable the mind shift.

5.2.3 ICT Policies, beliefs about the environment and Green IT practice

The third hypothesis (H3) was, ICT policy has a positive significant effect on beliefs about the environment. While the seventh hypothesis (H7) was, ICT policy has a positive significant effect on Green ICT practice. Lastly, hypothesis H11 states that Beliefs about the environment positively mediate the relationship between ICT policies and Green ICT practice. Given that environmental sustainability is a macro move that requires a concerted effort, it is imperative that governments prioritise it (Al-Khouri, 2013). These hypotheses were formulated basing on extant albeit dearth literature from studies that focused on how policies shape Green IT (Al-Khouri, 2013; Cater-Steel & Tan, 2011; Lee et al., 2013; Zhang & Liang, 2013). These hypotheses were compared to the observed models to test for any significant difference.

The content validity for the items for ICT policy was .94 which is above the recommended S-CVI/Ave of .80 (Polit & Beck, 2006). Reliability was .89 which is also above the threshold of .7 (Cronbach, 1951; Nunnally, 1987). The AVE of ICT policy was .56. These also confirm that the measurement scale of ICT policies can be generalised.

The results of the observed model for ICT policy and beliefs about the environment established that ICT policy has a negative effect on beliefs about the environment with a path coefficient of -.161 and significance of p=.045. This is a departure from H3 that hypothesised a positive significant relationship. The results of the observed model for ICT policies and Green ICT practice show a positive but insignificant effect of ICT policies on Green IT practice with a path coefficient of .072 and p=.233. This means that hypothesis H7 was not supported. The results of the observed model for mediating effect of beliefs about the environment on the relationship between ICT policies and Green IT practice reveal a path coefficient of -.037 which is significant with p=.023. This also reveals a departure from H11 that hypothesised a positive effect; a negative effect was found.

However, according to the results of the regression analysis, ICT policies don't explain the variance in beliefs about the environment but explain 2.7% of the variance in Green IT practice. The effect of beliefs about the environment on the relationship between ICT Education and Green ICT practice was found significant with a significant level of p=.005394 and Sobel z-value of 2.782503. Beliefs about the environment predict 28.5% of the relationship between ICT policies and Green ICT practice.

This study reveals that only 25% of the respondents agree that the national ICT policies guide the use of ICT in consideration of the environment; 33% of the respondents do not agree that while a whole 42% were not sure. However, other questions show that many people are not even aware of the national ICT policies (65.2%). Therefore, there might have been likelihood that the results would not have presented a negative effect. The government has the mandate to prioritise environmental sustainability through policies, laws and other means. However, the findings here show that even though there are national ICT policies, they don't have a statement on environmental sustainability and are worse of all poorly disseminated. This revelation is in agreement with the findings of Al-Khouri (2013) that many countries have e-government plans that do not cater for environmental sustainability and have poor communication strategies. The negative effect

of ICT policies on beliefs about the environment might be as a result of the poor dissemination of ICT policies and the minimal mention of environmental sustainability therein. Lee et al. (2013) emphasize the need for public-private cooperation between government and the citizens through research and innovation to achieve successful Green IT.

Many computers have been shipped from the Western world to developing countries in Asia and Africa; these are then re-used briefly and then dumped in environmentally unfriendly ways (Al-Khouri, 2013; Umair et al., 2015). The Government of Uganda with the Vision 2040 is fronting ICT as one of the vehicles to develop the country into a knowledge economy. Therefore, donations of used computers from the Western world have for long been much sought. This is in line with Zhang and Liang (2012, p.1003) who state that there is always a discrepancy between what is formulated and what is implemented in terms of Green IT policies because it is done through bargaining within the Political process. The study by Zhang and Liang (2012) also established that regulations and policies are not in tandem with the industry practice. Thus the industry practice is ahead of the regulations and policies. Uganda does not manufacture ICT equipment but only purchases them or they are donated. Therefore, it is even harder to regulate the type of equipment that is brought it. Umair et al. (2015) in their conclusion posit that many countries have ICT rules and regulations to guide reuse and recycling of ICT equipment but most times, due to the black market nature of the undertaking, they are not enforced.

5.2.4 Organisational structure, beliefs about the environment and Green IT practice

Hypothesis H4 of the study was, organisational structure has a positive significant effect on beliefs about the environment. The eighth hypothesis (H8) was, organisational structure has a positive significant effect on Green ICT practice. Hypothesis H12 states that beliefs about the environment positively mediate the relationship between organisational structure and Green ICT practice. Melville (2010) introduced organisational structure to the BAO model because it was found to lead to dual

socialisation. Human beings are social animals and therefore, dual socialisation is how the individual psychic is shaped by social and organisational structure. The values of the organisation shape an individual's belief formation towards the environment (Melville, 2010). The structure of the organisations therefore, plays an important role in shaping one's beliefs about the environment and ultimately their Green ICT practice. On that premise, hypotheses H4, H8 and H12 were formulated and the hypothesised models tested against the observed models.

The content validity for the items for organisational structure was .83 which is also above the recommended S-CVI/Ave of .80 (Polit & Beck, 2006). Reliability coefficient was .87 which is above the threshold of .7 (Cronbach 1951; Nunnally, 1987). The AVE of organisational structure was .52. These also confirm the generalisability of the measurement scale of organisational structure.

The results of the observed model for organisational structure and beliefs about the environment established that organisational structure has a positive effect on beliefs about the environment with a path coefficient of .247 and significance of p=.002. This is in support of H4 that also hypothesised a positive relationship. The results of the observed model for organisational structure and Green ICT practice show a positive and significant effect of organisational structure on Green ICT practice with a path coefficient of .277 and p=.000. This means that hypothesis H8 was supported. The results of the observed model for mediating effect of beliefs about the environment on the relationship between organisational structure and Green IT practice reveal a path coefficient of .056 which is significant with p=.005. This also reveals that hypothesis H12 was supported.

According to the results of the regression analysis, organisational structure explains the variance in beliefs about the environment by 2.1%. Organisational structure explains 3.7% of the variance in Green IT practice. The effect of beliefs about the environment on the relationship between organisational structure and Green ICT practice was found significant at p=.000204 and Sobel z-value of 3.714556. Beliefs about the environment

predict 36.2% of the relationship between organisational structure and Green ICT practice.

The items on organisational structure were geared towards establishing if organisations have programs and policies geared towards Green ICT. Many organisations are implementing Green IS initiatives in order to inculcate sustainable practices (Bengtsson & Ågerfalk, 2011; Seidel, Recker & vom Brocke, 2013; Watson et al., 2010). Notable among the questions, respondents were asked if there is top management support for Green ICT and 43% disagreed while 25% were not sure and only 32% agreed. The low explained variance of the effect of organisational structure on beliefs about the environment and Green IT practice can be attributed to the poor management support within the organisations. Mithas et al. (2010) established that for Green IT efforts to be successful, it is necessary to have top management commitment. Their finding established that top management commitment is positively associated with the importance accorded to Green IT in an organisation. In this study, top management support is low at 32% hence impacting the importance placed on Green IT. Worse of all, the other policies such as reuse, recycling and proper disposal of ICT equipment were found to be lacking in most of the organisations. Important to note however, is that telecommuting is on the rise with 51% of the respondents saying it is encouraged in their organisations, 41% disagreeing and 8% not being sure. This can be delved into even more to use IT to reduce movement of people, thereby reducing gas emission from transportation means. Other researchers also posit that the application of information systems in sustainability can be capitalised without necessarily applying all the Green IS initiatives (Dao, Langella & Carbo, 2011; Hedman, Henningsson & Selander, 2012).

5.2.5 Beliefs about the environment and Green ICT practice in Uganda

The study also set out to establish the effect of beliefs about the environment on Green ICT practice in Uganda as the fourth objective. This objective was done by testing hypothesis H13 which stated that Beliefs about the environment have a positive significant effect on Green ICT practice. Beliefs about the environment were initially

measured using three constructs; beliefs, desires and opportunities (Melville, 2010). However, after the EFA, the construct Desires was dropped and so only two constructs were maintained. The hypotheses for beliefs and opportunities stated that; H13a Beliefs have a positive significant effect on Green ICT practice and H13c Opportunities have a positive significant effect on Green ICT practice. These hypotheses were compared to the observed models to test for any significant difference.

The content validity for the items for beliefs about the environment was .96 while that of Green ICT practice was .90 which are both above the recommended S-CVI/Ave of .80 (Polit & Beck, 2006). Reliability of beliefs about the environment was .92 while that of Green ICT practice was .87 which are also both above the threshold of .7 (Cronbach 1951; Nunnally, 1987). The AVE of beliefs about the environment was .552 with a discriminant validity of .465, .369 and .459. These confirm that the measurement scale can be generalised because construct validity, reliability and discriminant validity were confirmed.

The results of the observed model of beliefs about the environment and Green ICT practice established that beliefs about the environment have a positive significant effect on Green ICT practice with a path coefficient of .213 and significance of p=.000, thereby supporting H13. The path coefficients for beliefs and opportunities were .736 and .713 respectively, with both items being significant at $p<0.001$. These findings are also in support of H13a and H13c.

Regression analysis revealed that beliefs about the environment explain 11.7% of the variance in Green ICT practice; with beliefs contributing the highest variance of 6.5% and opportunities contributing 6.4%. For one to engage in Green ICT practice, their psychic states (beliefs, desires, opportunities) about the natural environment should be formed (Melville, 2010). This study established that beliefs and opportunities are imperative in shaping a person's beliefs about the environment that then spurs them into Green ICT practice. The study however, established that a person's desires are not a

strong factor in affecting Green ICT practice. Bottrill (2007) also found that people display a social welfare element that influences their attitude towards Green IT. The author therefore, also found that beliefs about the environment are an important predictor of whether one will engage in Green ICT practice or not. This is also backed by Bock, Zmud, Kim and Lee (2005) who posit that motivational factors that can be espoused in beliefs, desires and opportunities presented by Green ICT influence a person into actually adopting Green ICT.

5.2.6 Identifiability, Evaluation and Monitoring and beliefs about the environment and Green ICT practice

Lastly, the fifth objective of this study was to assess the moderating effect of identifiability, expectation of evaluation and awareness of monitoring on the relationship between beliefs about the environment and Green ICT practice in Uganda. This objective was done by testing three hypotheses. Hypothesis H14 states that identifiability positively moderates the relationship between beliefs about the environment and Green ICT. Hypothesis H15 states that expectation of evaluation positively moderates the relationship between beliefs about the environment and Green ICT. Hypothesis H16 states that awareness of monitoring positively moderates the relationship between beliefs about the environment and Green ICT. These were adopted from the accountability theory of Tetlock and Lerner that describes how a person makes decisions and follow up procedures basing on the perception of justifying their actions to others that they feel accountable to (Lerner & Tetlock, 1999). The observed models were tested against the three hypotheses to check for any differences.

The content validity for the items for identifiability, evaluation and monitoring were .83, .85 and .75 respectively which are above the recommended S-CVI/Ave of .80 (Polit & Beck, 2006) except for Monitoring which were reviewed and improved. Reliability coefficient for identifiability, evaluation and monitoring were .94, .94 and .95 respectively which are above the threshold of .7 (Cronbach 1951; Nunnally, 1987). The AVE of identifiability, evaluation and monitoring were .58, .64 and .63 respectively.

These also confirm that the measurement scale of three variables can be generalised because construct validity and reliability were confirmed.

Studies of Eargle et al. (2013), Lerner and Tetlock (1999), Vance et al. (2011) and Vance et al. (2015) put forward that when a person is aware that their work can be linked to them and thereby exposing their true self, they tend to adhere to what they are supposed to do. This means that identifiability causes someone to adhere to what they are supposed to do. This study however, established that identifiability is not a significant predictor of Green ICT practice. Its moderation effect in the relationship between beliefs about the environment and Green ICT practice was not significant. This can be seen in the results of the observed model for moderating effect of identifiability on the relationship between beliefs about the environment and Green ICT practice that reveal a path coefficient of -.072 which is not significant with p=.082. This shows a departure from H14 that hypothesised a positive effect; a negative effect was found and hypothesis H14 was not supported. Further, the regression analysis established that identifiability explains 20.9% of the variance in beliefs about the environment but not significant (p=.825). The results of the Modgraph also found no moderating effect of identifiability on the relationship between beliefs about the environment and Green ICT practice.

Secondly, the results of the observed model for moderating effect of evaluation on the relationship between beliefs about the environment and Green ICT practice reveal a path coefficient of .106 which is significant with p=.010. This reveals that H15 was supported. Expectation of evaluation explains 20.8% of the variance in beliefs about the environment but not significant (p=.167) unlike the results found in the SEM. The results of the Modgraph also found no moderating effect of evaluation on the relationship between beliefs about the environment and Green ICT practice. Other related studies put forward that expectation of evaluation increases one's focus to engage in socially acceptable behavior (Eargle et al., 2013; Frink & Klimoski, 2004; Lerner & Tetlock, 1999; Vance et al., 2011; Vance et al., 2015). However, this study reveals that

expectation of evaluation has no significant effect on Green ICT practice as can be seen in the results of two out of the three analyses run.

Lastly, when people are aware that there is an audience monitoring what they are doing, they usually work in conformity with the known expectations (Eargle et al., 2013; Lerner & Tetlock, 1999; Vance et al., 2011; Vance et al., 2015). However, the results of the observed model for moderating effect of monitoring on the relationship between beliefs about the environment and Green ICT practice reveal a path coefficient of -.008 and is not significant with p=.837. This also shows a departure from H16 that hypothesised a positive effect and it was not supported. The regression results further established that monitoring explains 26% of the variance in beliefs about the environment but not significant (p=.196). The results of the Modgraph found no moderating effect of monitoring on the relationship between beliefs about the environment and Green ICT practice.

5.3 Conclusion

This study sought to answer the overarching question; how do societal structure, ICT education, ICT policies and organisational structure affect Green ICT practice in Uganda? It provided empirical evidence to substantiate a triangulation of the BAO model and Accountability theory while adding two variables; ICT education and ICT policies.

Even though there has been some research conducted in Green ICT, there are still gaping holes. Academics have been left behind in the wake of environmental sustainability, more so Green ICT even though it is one of the most pressing issues in today's world and the near future. There have been calls to academics to join in Green ICT and to go further and introduce sustainability in courses at University level in order to get graduates with the knowledge and will to join in environmental sustainability. Also there is dearth literature on the how national ICT policies shape Green ICT. Moreover, many countries including Uganda do not have any Green ICT policies in place. Most Green ICT research

has been conducted in countries with a different economic, social and political setup from Uganda which is a Low developed country with many decisions made based on political motivations. Out of the 337 articles initially extracted for this study, the subsequent articles included in the literature assessment had 15 focusing on Green ICT, 9 on Green ICT and education and only 4 on Green ICT and policies. Further still, only 4 out of the 28 articles were based on African countries; Nigeria and Kenya. The literature search was not able to establish a relevant article about Uganda.

The findings reveal that most of the hypotheses were supported. Societal structure has a positive significant effect on beliefs about the environment. ICT education has a positive significant effect on beliefs about the environment. Organisational structure has a positive significant effect on beliefs about the environment. Additionally, societal structure has a positive effect on Green ICT practice, ICT education has a positive effect on Green ICT practice and organisational structure has a positive significant effect on Green ICT practice. For the mediating effects of beliefs about the environment, the results show that; beliefs about the environment positively mediate the relationship between societal structure and Green ICT practice. Beliefs about the environment positively mediate the relationship between ICT education and Green ICT practice. Beliefs about the environment positively mediate the relationship between organisational structure and Green ICT practice. Beliefs about the environment have a positive significant effect on Green ICT practice.

However, even though supported, it was found that ICT policies have a negative effect on beliefs about the environment while beliefs about the environment negatively mediate the relationship between ICT policies and Green ICT practice. These findings are different from the hypothesized ones that had posed a positive relationship.

Findings further reveal that some hypotheses were not supported. These included; ICT policy has a positive significant effect on Green ICT practice. Identifiability positively moderates the relationship between beliefs about the environment and Green ICT.

Expectation of evaluation positively moderates the relationship between beliefs about the environment and Green ICT. Awareness of monitoring positively moderates the relationship between beliefs about the environment and Green ICT.

This study presents a triangulation of the BAO model and Accountability theory and further adds a new dimension of ICT education and ICT policies to test a new model. After gathering empirical evidence a new model was formulated that proposes beliefs about the environment mediating the relationship between societal structure, ICT education, organisational structure and Green ICT practice (as can be seen in the final model). However, ICT policy was dropped from the initial conceptual framework because it was established that its effect is negative and not significant.

5.4 Contributions and Implications of the study

5.4.1 Methodological Implications

This study makes a methodological contribution by adapting and introducing new variables; ICT education and ICT policy in the BAO model. Previously, the BAO comprised of societal and organisational structure as the main predictor variables; however, this study tested ICT education and found it also a significant predictor. Even though ICT policy was also introduced, it wasn't found to be a significant predictor of beliefs about the environment (even though it predicts Green ICT). Other studies in Green ICT can therefore, adopt and further test these variables.

By triangulating the accountability theory with BAO model, this study has also shown that among the three variables adopted from the accountability theory, none was found significant. Even though expectation of evaluation was found significant in the SEM model, both the regression analysis and Modgraph didn't find a significant moderating effect on the relationship between beliefs about the environment and Green ICT practice. Awareness of monitoring and identifiability were not found to be significant predictors of

Green ICT in all the three tests. This study therefore, empirically shows that these variables don't predict Green ICT.

5.4.2 Theoretical Contribution and Implications

The theoretical contributions of this study are derived from the results of the observed models. Firstly, the study established that societal structure is the biggest influence on beliefs about the environment among the variables studied. Cultural influence such as media exposure to environmental issues, cultural emphasis on environmental issues, local environmental conservation programs, community resources among others was found to have a greater impact on beliefs about the environment than normative patterns. Furthermore, societal structure has the second largest influence on Green ICT practice and the highest influence on the indirect influence on Green ICT practice through beliefs about the environment. These findings offer further empirical evidence in support of the importance of societal structure on Green ICT as a put forward in the BAO model.

Organisational culture was found to have the second biggest influence on beliefs about the environment. These focused on organisational Green ICT endeavours such as organisational Green ICT policies, paper consumption reduction endeavours, proper ICT equipment reuse, recycling and disposal, management support among others. This study also established that organisational structure has the biggest effect on Green ICT practice among the four variables and second biggest indirect influence on Green ICT practice through beliefs about the environment. These findings also further contribute empirical evidence towards the BAO model.

ICT education is a contribution to the triangulated BAO model with accountability theory. ICT education was found to have the third prominent influence on beliefs about the environment. This shows that it is also an important facet to the development of beliefs about the environment that spur one into Green ICT practice. Most of the studies about education and Green ICT didn't focus on ICT education specifically and also didn't

focus on its influence on beliefs about the environment but rather on Green ICT only. The findings of this study also indicate that ICT education influences Green ICT directly and indirectly through beliefs about the environment. The theoretical implication of these findings is in form of an advancement of a conceptual framework that adds ICT education to societal structure and organisational structure as factors that influence beliefs about the environment and Green ICT.

The other contribution that the study offers is the addition of ICT policies to test the effect on beliefs about the environment and Green ICT. Empirical evidence shows that ICT policies have a negative effect on beliefs about the environment. However, its direct effect on Green ICT was found not significant while its indirect effect on Green ICT through beliefs about the environment was found negative. Therefore, even though it was conceptualized in the original framework, ICT policy was dropped from the final model. Albeit, this study contributes findings to the effect that ICT policies may have a negative effect on Green ICT. The implication is that studies leading to theories or models of Green ICT should test this construct again in areas where ICT policies have been disseminated to establish if the hypothesized model will be supported.

One of the objectives of this study was to test the effect of beliefs about the environment on Green ICT practice in Uganda. This study presents findings that beliefs about the environment is a very significant indicator of Green ICT practice. Among the constructs of the variable beliefs about the environment that were proposed by Melville (2010), only opportunities were found to have a significant effect on Green ICT. The construct beliefs was not found to be a significant predictor while the construct desires was discarded adter the exploratory factor analysis. The theoretical implication of this finding is that studies on Green ICT should test for people's beliefs about the environment. This is similar to theories that test for intention to use and actual use of systems.

Identifiability was tested to see its moderating power on the relationship between beliefs about the environment and Green ICT practice. This study contributes empirical evidence

that it has a low negative effect which is not significant. This implies that, even when a person is aware that their work can be linked to them and thereby expose their true self, it does not motivate them to engage in Green ICT practice. Expectation of evaluation was found to have a positive effect on the relationship between beliefs about the environment and Green ICT practice. Therefore, this study contributes empirical evidence that when a person expects that their work will be assessed by other persons basing on some rules and regulations with ensuing consequences, they will tend to engage in Green ICT practice. The study also contributes scientific findings that awareness of monitoring does not increase the likelihood that a person with beliefs about the environment will engage in Green ICT practice. The contrary, that it reduces the likelihood is supported by the findings. In a nutshell, the constructs adopted from the accountability theory were mostly found to be not significant, therefore, they may not be a good indicator of the relationship between beliefs about the environment and Green ICT.

This study makes a contribution of a new Green ICT model by triangulating some constructs of the Accountability theory with the BAO model and adding more constructs; ICT education and ICT policies that help investigate Green ICT practice. The output of this study is the Mlay model of Green ICT that conceptualises that (1) societal structure, ICT education and organisational structure affect beliefs about the environment, (2) societal structure, ICT education, ICT policies and organisational structure affect Green ICT practice, (3) beliefs about the environment mediate the relationship between societal structure, ICT education, organisational structure and Green ICT practice and (4) Expectation of evaluation moderate the relationship between beliefs about the environment and Green ICT. These can further be replicated in future research in other parts of the world and specifically areas similar to Uganda.

Lastly, most of the studies in Green ICT have been conducted in developed countries such as USA, China and Australia. Given the differences in economic, social and political between these countries and low developed countries such as Uganda, this study appends literature in Green ICT in low developed countries. Future researchers in a similar area

can use the findings of this study to develop their own studies. More so, a lot of the extant literature is based on secondary data. This study contributes findings mostly from primary data with a systematic literature review of secondary data.

5.4.3 Managerial Implications

The importance of organisational structure in beliefs about the environment and Green ICT point to the fact that there should be more emphasis on organisations in environmental conservation. This can be done by placing more prominence on organisational Green ICT initiatives. The study established that it is important for organisations to have Green ICT policies and initiatives. Further, appointing a Green ICT champion goes a long way to make more people aware of Green ICT. Management of organisations should be interested in leading and supporting these Green ICT initiatives. Other studies established that Green ICT impact the behaviour of the organisation by changing the functioning and many times the performance of the organisation. Therefore, organisational participation in Green ICT offers benefits directly to the organisation as well.

The importance of ICT education in Green ICT, even though not well incorporated imply that University course review committees should develop ICT courses that cover sustainability or Green ICT. Empirical evidence propounds that indeed a person's exposure to the positive and negative impact of ICT and how IT can be used to manage and conserve the environment influence their beliefs about the environment and participation in Green ICT. Moreover, this awareness will also impact managers who are in charge of making company policies and supporting Green ICT in organisations.

Management and Green ICT champions of organisations should educate people on the opportunities afforded by Green ICT. The findings of this study demonstrate that if people envisage that there are opportunities to be derived from their participation in Green ICT to the environment, they will be more willing to participate. These

opportunities include those derived from conserving the environment by reducing carbon emission, reducing paper consumption, enabling reuse and recycling of ICT equipment and reducing e-waste landfills.

5.4.4 Policy Implications

The implication of the findings of societal structure is that there should be more emphasis on cultural factors that influence people in order to improve their beliefs about the environment. This means there should be more deliberate national and community policies to empower communities with programs and finances to run more environmental conservation initiatives that will ultimately impact individual's beliefs about the environment and their participation in Green ICT. Many governments such as the Government of Uganda have grassroots structures such the Local Council that can be patterned with and funded to institute community green ICT initiatives. Also, given there is an influence from normative patterns that mainly comprise of people of influence such as church and political leaders, there can also be deliberate policies instituted to empower such people of influence to have more influence on other people in their society.

There is need for policy to be formulated that guides the inclusion of Green ICT or sustainability as a whole in ICT education. This study has established that ICT education is an important factor that can be used to create more awareness of the positive and negative impacts of ICT and more importantly how ICT can be used to manage and conserve the environment. Many countries already have accreditation bodies that have the mandate to monitor, guide and approve education structures and content. For example the Government of Uganda has the National Council for Higher Education (NCHE) that is charged with that mandate. Policies can be formulated to incorporate sustainability courses or course content in every university program and implementation enforced.

Most of the respondents indicated that they were not familiar with the national ICT policies and therefore, didn't know if it has a mention of Green ICT. The negative and

insignificant effects that were found from the results could be as a result of the largely ignorant disposition of most people in light of ICT policies. It is the onus of governments to disseminate policies to people. Therefore, this finding lends scientific information that there is poor dissemination of the national ICT policies of Uganda. This therefore, should be tackled with urgency to go in line with the global call for environmental sustainability.

Additionally, the findings from extant literature indicate that there are still very few governments such as the Australian government that have developed and implemented environmental sustainability plans. A look at the Vision 2040 of Uganda shows some generalised statements on greening the economy though it is not specific to Green ICT. Likewise, the Vision 2030 of Kenya doesn't reveal Green ICT either. The National ICT Policy for Uganda has some scanty mention of ICT and the environment. Findings from primary data indicate a negative effect of ICT policies on beliefs about the environment and Green ICT though analysis of the data shows most people are not familiar with the policies. It is possible that if people were more aware of these policies, the effect would not have been negative. This study offers information to policy makers to incorporate Green ICT in not only the ICT policies but also other national development plans such as the Vision plans.

5.5 Recommendations

According to the findings from this study, societal structure was established to have the greatest effect on beliefs about the environment. Extant literature indicate that Africa (and in particular Uganda) fall under high context of culture were communalism is highly rated. It is therefore, recommended that Green ICT projects/initiatives should be implemented through the local community. It is likely to reach a wider range of people who are more in touch with their local communities.

ICT education was also found have a positive influence on both beliefs about the environment and Green ICT. However, it has not yet been harnessed by the academics

despite its influence. Empirical evidence from this study therefore, alludes to the recommendation that sustainability content should be added in the ICT curriculum to create knowledge and awareness of Green ICT in order to manage and conserve the environment. Both the accrediting bodies and university course review committees should take the mandate to ensure that sustainability is added in the ICT curriculum of all university programs.

Most of the respondents were not aware of the National ICT policy of Uganda despite the fact that a large part of the population uses ICTs. There is need to disseminate national ICT policies to the masses. Even though the findings of this study indicate that ICT policy has a negative insignificant effect on beliefs about the environment and a negative significant effect on Green ICT, it could be seen that there was largely ignorance of the policy. It is imperative that the policy makers devise ways of disseminating them. These policies further need to be enforced in order to take effect.

By reviewing the National ICT policy of Uganda, there is very little mention of ICT and the environment. Green ICT, even though very important amidst the environmental degradation challenges currently faced has largely been neglected in national policies. This study recommends that national policies specific to Green ICT should be drafted and incorporated in the national ICT policies of countries that have not yet done it, Uganda inclusive. In addition to the national ICT policies, individual organisations should equally develop company Green IT policies according to their capabilities. Organisations, after looking at the national ICT policies specific to the environment should then devise ones specific to them.

Organisational structure was established as the second biggest effect on beliefs about the environment and the greatest effect on Green ICT practice among the variables tested. Respondents indicated that top management support is very important for Green ICT initiatives in organisations. It is recommended that there should be more top management support in order to be able to ably implement Green ICT initiatives in organisations.

Awareness of the opportunities offered by Green ICT to both an individual and the entire organisation was established to have a significant influence on Green ICT. It is therefore, recommended that individuals should be clearly shown the opportunities presented by Green ICT because this may lead to them engaging in Green ICT initiatives.

Lastly, SEM results indicated that respondents will engage in Green ICT if they expect to be evaluated. Expectation of evaluation increases the relationship between beliefs about the environment and Green ICT practice. Therefore, where staff are aware that their Green ICT efforts will be assessed according to set rules and regulations and held responsible for their actions, they are more likely to engage in Green ICT. Both organisations and national policy makers should devise means of evaluating people to increase their participation in Green ICT.

5.6 Limitations

This study adopted a post-positivist quantitative research design. Human behaviour is influenced by a number of factors and variables that may be discovered by the researcher in the course of the study and therefore, impossible to adequately address in any given study. Even though post-positivist paradigm allows for some seeking of participants perspectives, it does not fully cater for them like it would have been possible with qualitative research. Therefore, the findings of this study may not fully capture the perspectives of the respondents.

Data for the study were collected from Uganda only, which was the geographical scope of the study. However, to mitigate this limitation, two stage cluster sampling was adopted in order to get respondents from both public and private sector. The respondents were clustered under public, for profit private and not for profit private organisations. This increases the generalisability of the findings of the study. However, collecting data from more than one country would have afforded the study better generalisability.

Given the nature of the study which is behavioural in nature, it would have been good to conduct a longitudinal study. The study adopted a cross-sectional design due to the short timeframe that was available to complete the study. However, when using survey design, the data collected at one point, due to the large size of the sample is also generalisable to the population.

The study used a self administered data collection method with a pre-coded questionnaire as the only tool for data collecting. Despite its abilities, pre-coded questionnaires limit the perspectives of respondents beyond that which is in the included items. To mitigate this problem, world renowned experts in Green ICT research were sought to validate the questionnaire and thereafter pretested for reliability before it was administered to the final respondents.

Additionally, there was dearth literature on ICT policies and Green ICT. Also most of the studies using accountability theory were not conducted in the purview of Green ICT. This made it difficult to develop the items for the data collection tools. Basing on the findings from extant literature, questions were formulated and the questionnaire was pretested for validity and reliability.

Using a systematic literature review approach, a selection criteria was formulated for articles to be included in the literature assessment. Out of the 337 articles initially sourced from different databases, only 28 were found eligible for inclusion. Only 4 of the articles were written about ICT policies while only 4 of the papers were based on African countries. This presented a limitation in the amount of literature that could be assessed for the study. However, the 28 articles were thoroughly screened by three reviewers and therefore, they were considered relevant for the study by consensus.

5.7 Areas for further study

The findings of ICT policies majorly indicate that most of the respondents were not familiar with the existing national ICT policies of Uganda; this may have biased the findings. Further research should be conducted on ICT policies and Green ICT but mostly using purposeful sampling to select respondents who are already aware of the policies. This will help confirm if the relationship between ICT policies and beliefs about the environment is actually negative.

Given that this study took a quantitative design, future researchers should consider conducting a similar study using either a qualitative design or mixed method design. This will enrich the findings by allowing for the development of new themes in the Green ICT which is still in its infancy in Uganda.

Also, given the behavioural nature of Green ICT, it would be imperative to conduct further longitudinal research track the changes in the behaviours of the respondents in their endeavours in Green ICT practice.

The primary data for this study was geographically limited to Uganda. Even though the sample size was large and the usable data from 362 respondents is generalisable, further research should expand the scope of a similar study to span more than one country. In the same premise, a comparative study should be conducted with the same constructs in both Low developed to developed countries to compare the findings.

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APPENDICES

Appendix 1: Questionnaire

THE ICT UNIVERSITY

YAOUNDE CAMEROON

Introduction to Respondents

Dear Respondent,

I am Samali V. Mlay, a PhD candidate of the above mentioned University undertaking a study titled "**Theorising ICT education and ICT policy in Green ICT: insights from the Belief Action Outcome model and Accountability Theory**" as my PhD thesis. Green ICT is defined as information technology and systems initiatives and programs aimed at addressing environmental sustainability. The study is for academic purposes and therefore, the results will not be used for other purpose.

As a user of ICTs, you have been carefully selected to participate in this study and your response will be highly appreciated. As a respondent, your opinions are very important to this study. Confidentiality will be maintained; you will not be described in any part of the thesis in any way that may lead to your identification.

For any further questions about the study or the researcher, please feel free to contact Dr. Clive K. Tsuma (PhD Coordinator) on ctsuma@ictuniversity.org or Prof. Victor W. Mbarika (Thesis Chairman) on victor@mbarika.com.

Filling this questionnaire will take about 20 minutes. I thank you in advance for your cooperation.

SECTION I

A. Background Information

Please tick (√) where appropriate

1. What is your gender (tick one)?

Male		Female	

2. What is your age group (tick one)?

Less than 20		20-30		31-40		41-50		Above 50	

3. What is your highest level of education (tick one)?

Diploma		Bachelor degree		Postgraduate Diploma		Master degree		PhD		Other Specify	

4. What type of organisation do you work with?

Public/Government		For Profit Private		Non Profit Private		Other (specify)	

5. Do you use any computing device at work or at home (tick one)?

Yes		No	

6. If yes, which one(s) (tick more than one if necessary)?

Phone		Laptop		Desktop computer		Tablet		Other (specify)	

7. Did you know that most of the parts of computing devices are not biodegradable (tick one)?

Yes		No	

8. Did you know that toxic chemicals are used in the manufacture of a computing device (tick one)?

Yes		No	

9. Did you know about Green ICT (tick one)?

Yes		No	

SECTION II

In this section, tick the most appropriate response reflecting your level of agreement with the statement in the question items. These have been coded with numbers from 1 to 5 where; **1= strongly disagree (SD), 2 = disagree (D), 3 = not sure (NS), 4 = agree (A) and 5 = strongly agree (SA)**.

B. SOCIETAL STRUCTURE

This section has question items that are geared towards establishing societal structure that may have influenced your beliefs about the environment. This is expected to be achieved by considering two main areas; cultural influence and normative patterns.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
	Cultural influence					
SC1	I have had media exposure to environmental issues (e.g. through newspapers, documentaries, movies, radio etc).	1	2	3	4	5
SC2	My culture emphasizes conservation of the environment.	1	2	3	4	5
SC3	My community has local environmental conservation programs.	1	2	3	4	5
SC4	My community has available resources to use for environmental conversation.	1	2	3	4	5

SC5	My status in my community requires me to participate in environmental conservation.	1	2	3	4	5
SC6	The people in my community who actively participate in environmental conservation are rewarded.	1	2	3	4	5
	Normative patterns					
SN1	Some of my family members engage in conserving the environment.	1	2	3	4	5
SN2	Some of my friends engage in conserving the environment.	1	2	3	4	5
SN3	Some of my religious members engage in conserving the environment.	1	2	3	4	5
SN4	Some of the political leaders I know engage in conserving the environment.	1	2	3	4	5
SN5	Some of the organisations in my community engage in conserving the environment.	1	2	3	4	5

C. ICT EDUCATION

This section has question items that are geared towards establishing your ICT education that may have influenced your beliefs about the environment.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
IE1	I have received some formal ICT education as a course, course unit/module or training.	1	2	3	4	5
IE2	I was made aware of the positive and negative impacts of ICT on the environment created by the physical existence of the ICT and the manufacturing process.	1	2	3	4	5
IE3	I was made aware of the positive and negative impacts of the ongoing use of ICT e.g. the energy used and saved due to the use of ICT.	1	2	3	4	5
IE4	I was made aware of the positive and negative impacts arising from many people using ICT over a period of time e.g. reduced movements.	1	2	3	4	5
IE5	I was made aware of how ICT can be used to conserve the environment.	1	2	3	4	5
IE6	I was made aware of the concept of Green ICT during my ICT classes.	1	2	3	4	5

D. ICT POLICIES

This section has question items that are geared towards establishing the national ICT Policies that may have influenced your beliefs about the environment.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
IP1	The Government of Uganda has formulated	1	2	3	4	5

	national policies that guide the use of ICT.					
IP2	I have access to the national ICT policies of Uganda.	1	2	3	4	5
IP3	I am aware of the national ICT policies of Uganda.	1	2	3	4	5
IP4	The national ICT policies guide the type of ICT hardware that I can purchase in consideration of the environment.	1	2	3	4	5
IP5	The national ICT policies guide how I should use ICT in consideration of the environment.	1	2	3	4	5
IP6	The national ICT policies guide how I can re-use ICT hardware (e.g. refilling toner, repairing equipment) in consideration of the environment.	1	2	3	4	5
IP7	The national ICT policies guide how I can recycle ICT hardware (e.g. adopting it to another use) in consideration of the environment.	1	2	3	4	5
IP8	The national ICT policies guide how I should dispose of ICT hardware such as laptops, mobile phone sets, toner cartridges, etc in consideration of the environment.	1	2	3	4	5

E. ORGANISATIONAL STRUCTURE

This section has question items that are geared towards establishing your organisational structure that may have influenced your beliefs about the environment.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
OS1	My organisation has a policy that guides the type of ICT hardware that can be purchased in consideration of the environment.	1	2	3	4	5
OS2	My organisation has implemented server virtualisation.	1	2	3	4	5
OS3	My organisation has implemented cloud computing.	1	2	3	4	5
OS4	My organisation uses thin client computing.	1	2	3	4	5
OS5	My organisation has a green data centre.	1	2	3	4	5
OS6	My organisation uses multifunctional printing devices (combined with scanner, fax machine etc).	1	2	3	4	5
OS7	My organisation encourages staff to minimise printing of documents.	1	2	3	4	5
OS8	My organisation encourages telecommuting (working from home to reduce travelling).	1	2	3	4	5
OS9	My organisation has a policy that guides re-use	1	2	3	4	5

	of ICT hardware in consideration of the environment.					
OS10	My organisation has a policy that guides recycling of ICT hardware in consideration of the environment.	1	2	3	4	5
OS11	My organisation has a policy that guides disposal of ICT hardware in consideration of the environment.	1	2	3	4	5
OS12	My organisation has a designated person(s) to champion environmental conservation.	1	2	3	4	5
OS13	The leadership/management of my organisation is committed to using ICT for environmental conservation.	1	2	3	4	5

F. BELIEFS ABOUT THE ENVIRONMENT

This section has question items that are geared towards establishing your beliefs about the environment that may have influenced your Green ICT practice. This is expected to be achieved by considering three main areas; beliefs, desires and opportunities.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
	Beliefs					
BB1	I believe environmental issues directly affect my life.	1	2	3	4	5
BB2	I believe I can use ICT to conserve the environment.	1	2	3	4	5
BB3	I believe the environment can be conserved by purchasing greener ICT hardware.	1	2	3	4	5
BB4	I believe the environment can be conserved by reducing the amount of paper consumption for printing.	1	2	3	4	5
BB5	I believe the environment can be conserved by telecommuting.	1	2	3	4	5
BB6	I believe the environment can be conserved by reducing energy consumption.	1	2	3	4	5
BB7	I believe the environment can be conserved by reducing the amount of carbon emission.	1	2	3	4	5
BB8	I believe the environment can be conserved by re-using ICT hardware.	1	2	3	4	5
BB9	I believe the environment can be conserved by recycling ICT hardware.	1	2	3	4	5
BB10	I believe the environment can be conserved through proper disposal of ICT hardware.	1	2	3	4	5
BB11	I believe the environment can be conserved through reduction of landfills of e-waste.	1	2	3	4	5
	Desires	1	2	3	4	5

BD1	I desire to purchase ICT hardware that is environmentally friendly.	1	2	3	4	5
BD2	I desire to reduce the amount of printing I do.	1	2	3	4	5
BD3	I desire to telecommute in order to conserve the environment.	1	2	3	4	5
BD4	I desire to see a reduction in energy consumption.	1	2	3	4	5
BD5	I desire to see a reduction in the amount of carbon emission into the environment.	1	2	3	4	5
BD6	I desire to re-use my ICT hardware in order to conserve the environment.	1	2	3	4	5
BD7	I desire to recycle my ICT hardware in order to conserve the environment.	1	2	3	4	5
BD8	I desire to dispose of ICT hardware in ways that are environmentally friendly.	1	2	3	4	5
BD9	I desire to see a reduction of landfills of e-waste.	1	2	3	4	5
	Opportunities					
BO1	Implementing Green ICT can help conserve the environment.	1	2	3	4	5
BO2	Implementing Green ICT can help reduce paper consumption	1	2	3	4	5
BO3	Implementing Green ICT can help reduce power consumption.	1	2	3	4	5
BO4	Implementing Green ICT can help reduce carbon emissions.	1	2	3	4	5
BO5	Implementing Green ICT can help re-use ICT hardware.	1	2	3	4	5
B06	Implementing Green ICT can help recycle ICT hardware.	1	2	3	4	5
B07	Implementing Green ICT can help reduce landfills of e-waste.	1	2	3	4	5

G. IDENTIFIABILITY

This section has question items that are geared towards establishing how identifiability (awareness that your output will be linked to you) may have influenced your Green ICT practice.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
ID1	Other people acknowledge my effort to purchase greener ICT hardware.	1	2	3	4	5
ID2	Other people acknowledge my effort to reduce the amount of printing I do.	1	2	3	4	5
ID3	Other people acknowledge my effort to telecommute.	1	2	3	4	5

ID4	Other people acknowledge my effort to reduce energy consumption.	1	2	3	4	5
ID5	Other people acknowledge my effort to reduce the amount of carbon emission.	1	2	3	4	5
ID6	Other people acknowledge my effort to re-use ICT hardware	1	2	3	4	5
ID7	Other people acknowledge my effort to recycle ICT hardware.	1	2	3	4	5
ID8	Other people acknowledge my effort to dispose of ICT hardware in an environmentally friendly way.	1	2	3	4	5

H. EVALUATION

This section has question items that are geared towards establishing how expectation of evaluation (expecting others to assess you) may have influenced your Green ICT practice.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
EV1	Other people evaluate my effort to purchase greener ICT hardware.	1	2	3	4	5
EV2	Other people evaluate my effort to reduce the amount of printing I do.	1	2	3	4	5
EV3	Other people evaluate my effort to telecommute.	1	2	3	4	5
EV4	Other people evaluate my effort to reduce energy consumption.	1	2	3	4	5
EV5	Other people evaluate my effort to reduce the amount of carbon emission.	1	2	3	4	5
EV6	Other people evaluate my effort to re-use my ICT hardware.	1	2	3	4	5
EV7	Other people evaluate my effort to recycle ICT hardware.	1	2	3	4	5
EV8	Other people evaluate my effort to dispose of ICT hardware in an environmentally friendly way.	1	2	3	4	5

I. MONITORING

This section has question items that are geared towards establishing how awareness of monitoring (awareness that others are monitoring you) may have influenced your Green ICT practice.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
MM1	I am aware that other people are monitoring my effort to purchase greener ICT hardware.	1	2	3	4	5
MM2	I am aware that other people are monitoring my effort to reduce the amount of printing I do.	1	2	3	4	5
MM3	I am aware that other people are monitoring my	1	2	3	4	5

	effort to telecommute.					
MM4	I am aware that other people are monitoring my effort to reduce energy consumption.	1	2	3	4	5
MM5	I am aware that other people are monitoring my effort to reduce the amount of carbon emission.	1	2	3	4	5
MM6	I am aware that other people are monitoring my effort to re-use ICT hardware.	1	2	3	4	5
MM7	I am aware that other people are monitoring my effort to recycle ICT hardware.	1	2	3	4	5
MM8	I am aware that other people are monitoring my effort to dispose of ICT hardware in an environmentally friendly way.	1	2	3	4	5

J. GREEN ICT PRACTICE

This section has question items that are geared towards establishing Green ICT practice. This has been categorised under; IT equipment procurement, use and disposal.

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
	IT equipment Acquisition					
GP1	The IT equipment I use is given to me by other persons (e.g. employer, family, friends etc).	1	2	3	4	5
GP2	When purchasing IT equipment, I buy any that is physically appealing.	1	2	3	4	5
GP3	When purchasing IT equipment, I buy any that is technologically appealing.	1	2	3	4	5
GP4	When purchasing IT equipment, I buy any that is environmentally friendly.	1	2	3	4	5
GP5	When purchasing IT equipment, I buy any that has an environment logo (e.g. Electronic Product Environmental Assessment Tool registered products).	1	2	3	4	5
	IT equipment Use					
GU1	I use ICT hardware that doesn't consume too much energy (e.g. with the Energy Star logo).	1	2	3	4	5
GU2	I use energy management software e.g. the Advanced Configuration and Power Interface (ACPI).	1	2	3	4	5
GU3	I leave my equipment on power saving mode when not using it.	1	2	3	4	5
GU4	I turn off my computer when not using it.	1	2	3	4	5
GU5	I turn off my monitor when not using the computer.	1	2	3	4	5
GU6	I use Backle (black background) on my	1	2	3	4	5

	computer to save power.					
GU7	I reduce paper consumption by using e-mails.	1	2	3	4	5
GU8	I reduce paper consumption by mostly reading on screen rather than printing.	1	2	3	4	5
GU9	I reduce paper consumption by electronically archiving documents.	1	2	3	4	5
GU10	I reduce paper consumption by using smaller font and margins.	1	2	3	4	5
GU11	I reduce paper consumption by recycling used paper.	1	2	3	4	5
	IT equipment Disposal					
GD1	I re-use ICT equipment (e.g. repairing them, replacing batteries, refilling toner cartridges etc)	1	2	3	4	5
GD2	I recycle ICT equipment whenever possible (e.g. converting it to another use or sending back to the manufacturer).	1	2	3	4	5
GD3	I dispose of ICT equipment in designated or gazetted places.	1	2	3	4	5
GD4	I adhere to policies that guide disposal of ICT equipment when disposing them,	1	2	3	4	5
GD5	I consider the environment when disposing ICT equipment.	1	2	3	4	5
GD6	I dispose of ICT equipment in an environmentally friendly manner.	1	2	3	4	5

Thank you. Samali V. Mlay (samalimlay@gmail.com), +256772676988, PhD Candidate

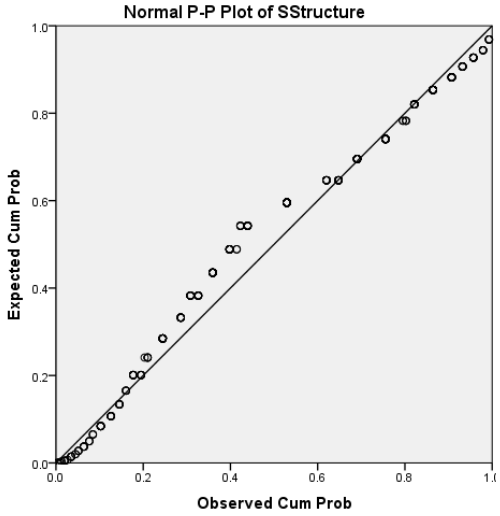
Appendix 2: Skewness and Kurtosis

Descriptive Statistics

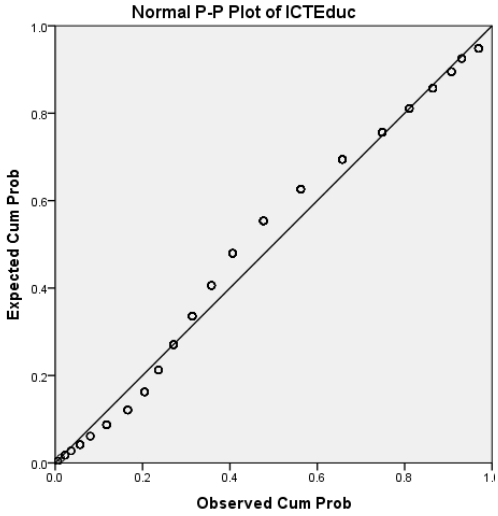
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
SStructure	362	1.75	5.00	3.8508	.61753	-.798	.128	.617	.256
ICTEduc	362	1.17	5.00	3.5460	.89346	-.451	.128	-.479	.256
ICTPolicies	362	1.00	5.00	2.9291	.85275	-.037	.128	-.398	.256
OrgStructure	362	1.00	5.00	2.8306	1.00850	.196	.128	-.476	.256
BelAboutEnviron	362	2.08	5.00	4.0600	.62766	-.637	.128	.314	.256
Identifiability	362	1.00	5.00	3.0868	.88212	-.149	.128	-.414	.256
Evaluation	362	1.00	5.00	2.9879	.88871	-.068	.128	-.424	.256
Monitoring	362	1.00	5.00	2.9002	.87617	.002	.128	-.439	.256
GreenICTPractice	362	1.33	5.00	3.4537	.72940	-.138	.128	-.278	.256
Valid N (listwise)	362								

Appendix 3: P-P Plots

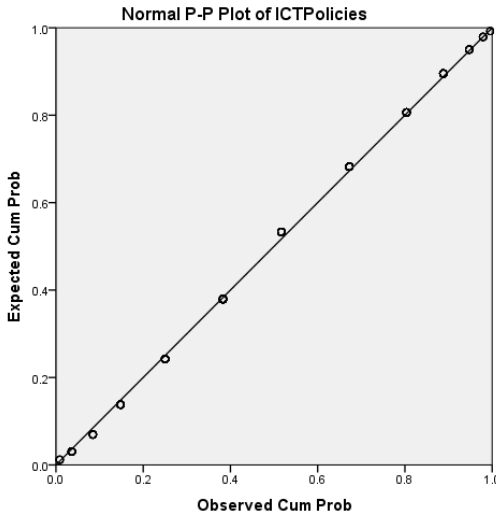
Appendix 3a: P-P Plot for Societal structure



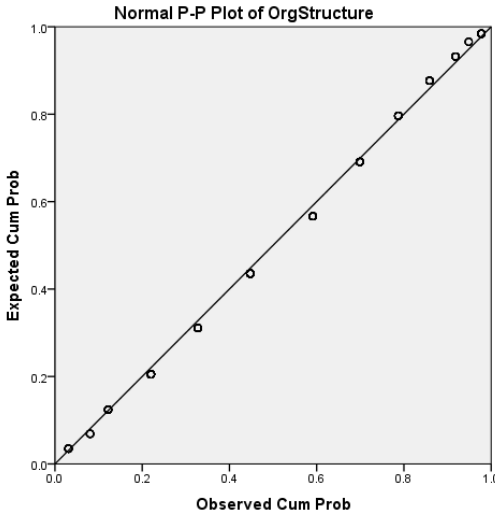
Appendix 3b: P-P Plot for ICT Education



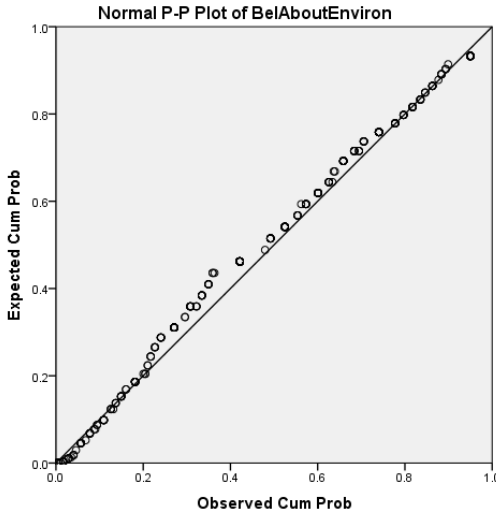
Appendix 3c: P-P Plot for ICT Policies



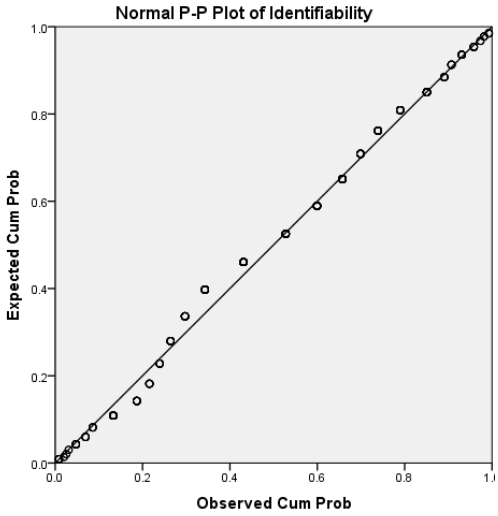
Appendix 3d: P-P Plot for Organisational Structure



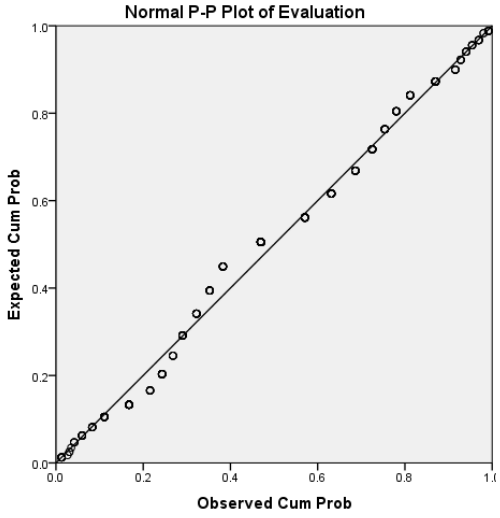
Appendix 3e: P-P Plot for Beliefs about the environment



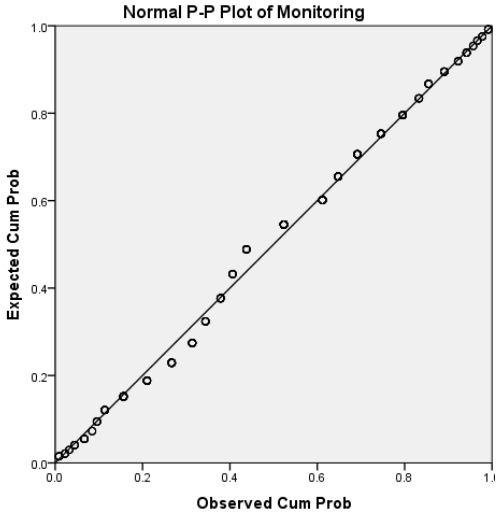
Appendix 3f: P-P Plot for Identifiability



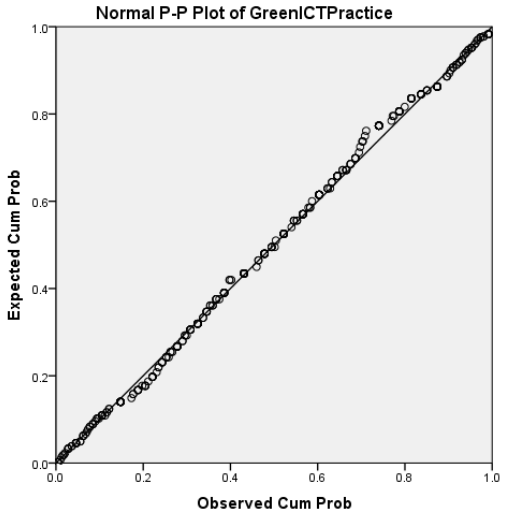
Appendix 3g: P-P Plot for Evaluation



Appendix 3h: P-P Plot for Monitoring

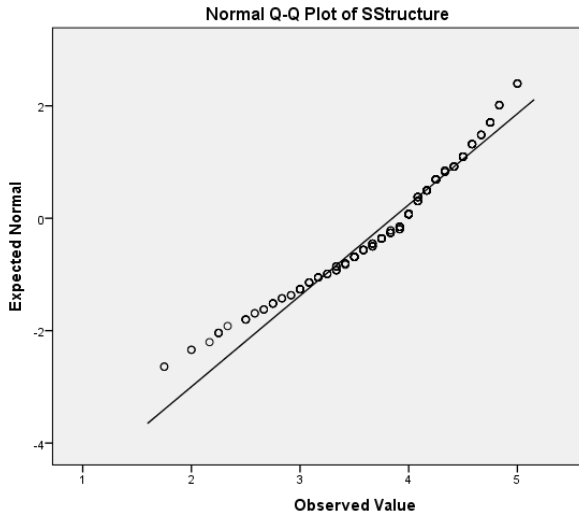


Appendix 3i: P-P Plot for Green ICT practice

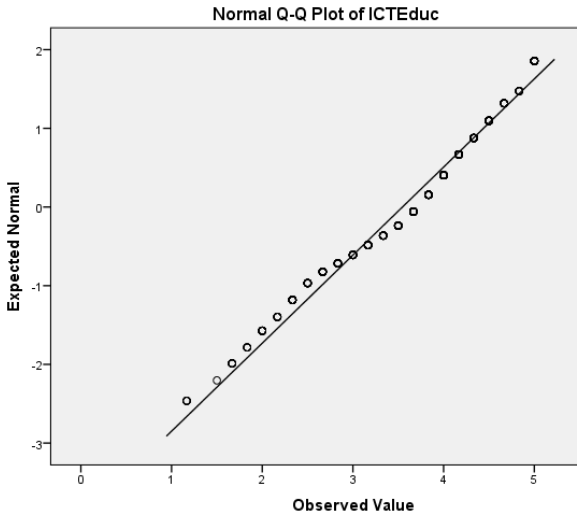


Appendix 4: Q-Q Plots

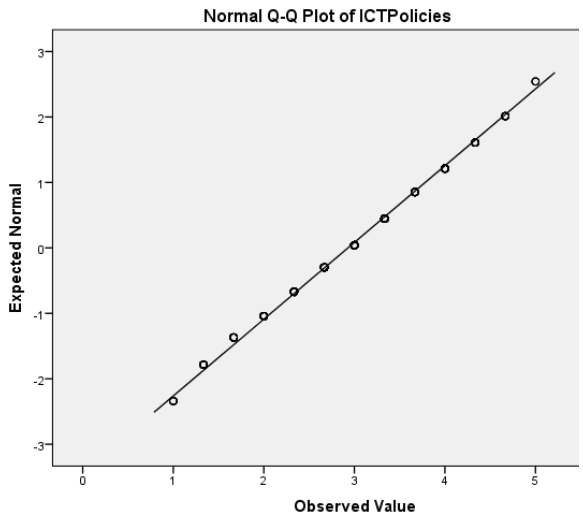
Appendix 4a: Q-Q Plot for Societal structure



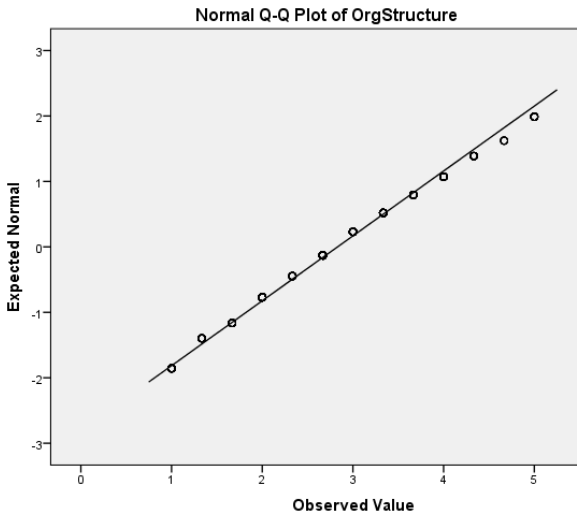
Appendix 4b: Q-Q Plot for ICT Education



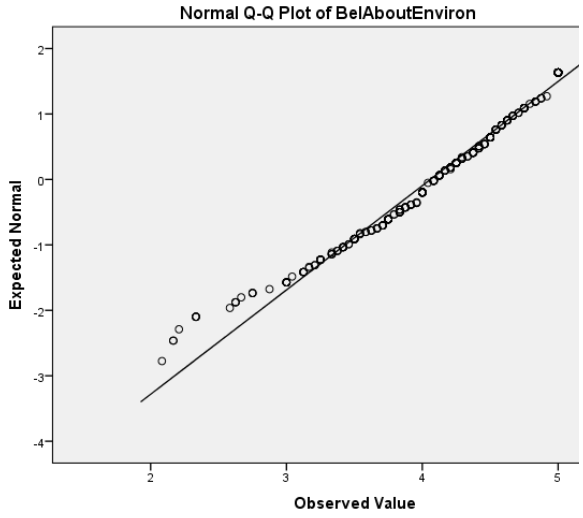
Appendix 4c: Q-Q Plot for ICT policies



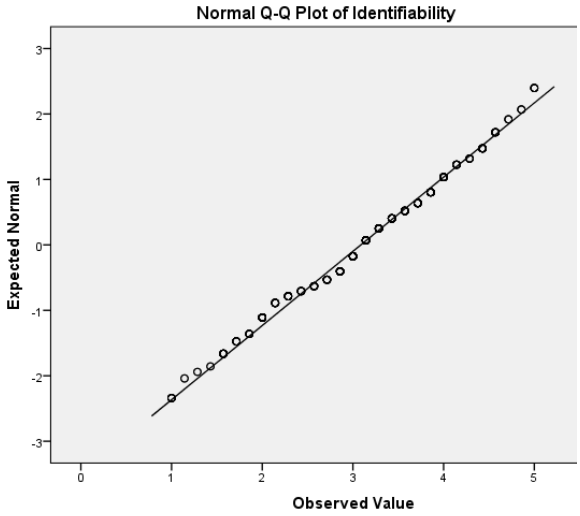
Appendix 4d: Q-Q Plot for Organisational structure



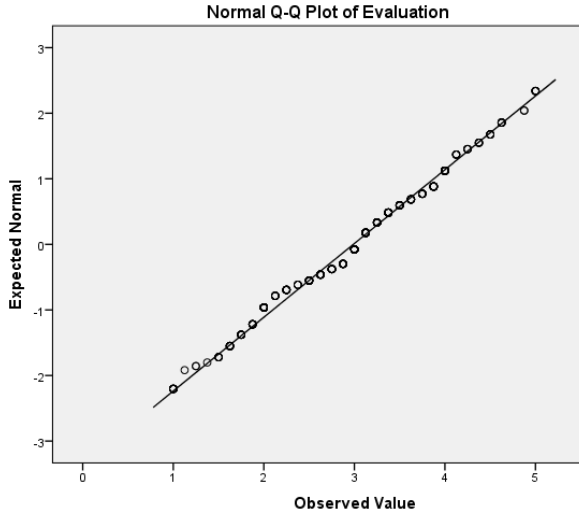
Appendix 4e: Q-Q Plot for Beliefs about the environment



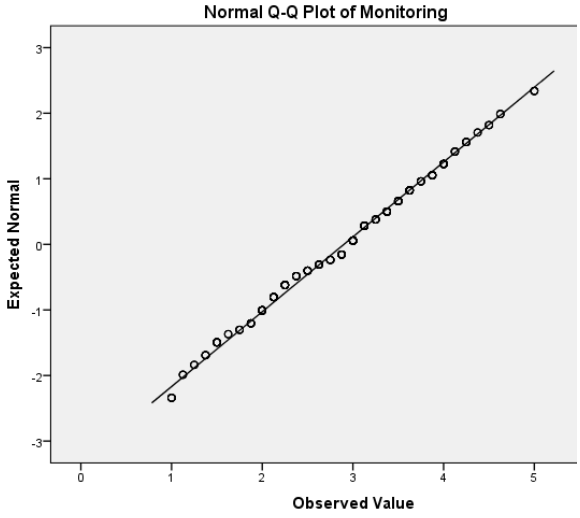
Appendix 4f: Q-Q Plot for Identifiability



Appendix 4g: Q-Q Plot for Evaluation



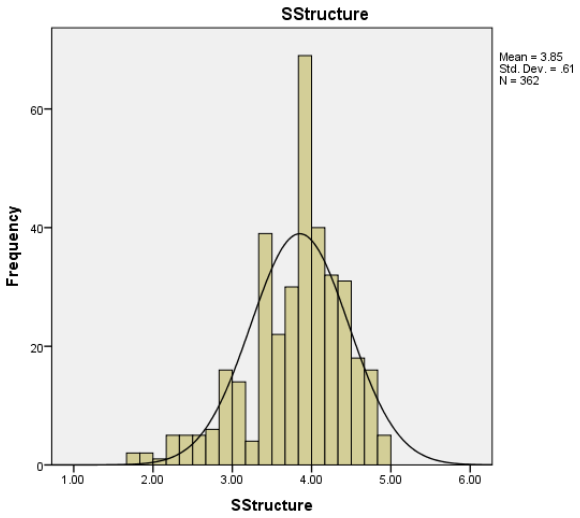
Appendix 4h: Q-Q Plot for Monitoring



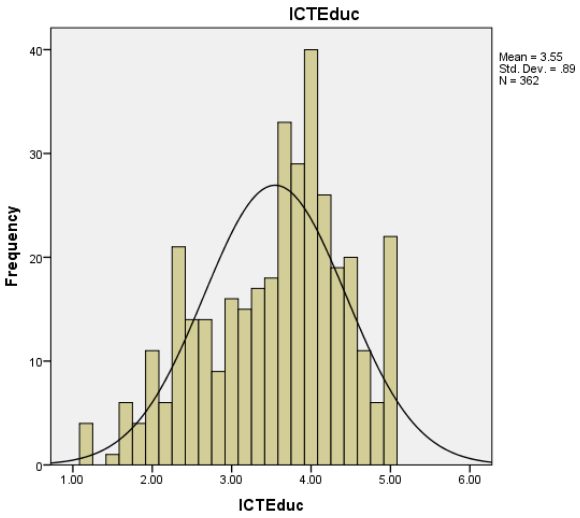
Appendix 4i: Q-Q Plot for Green ICT practice

Appendix 5: Histograms

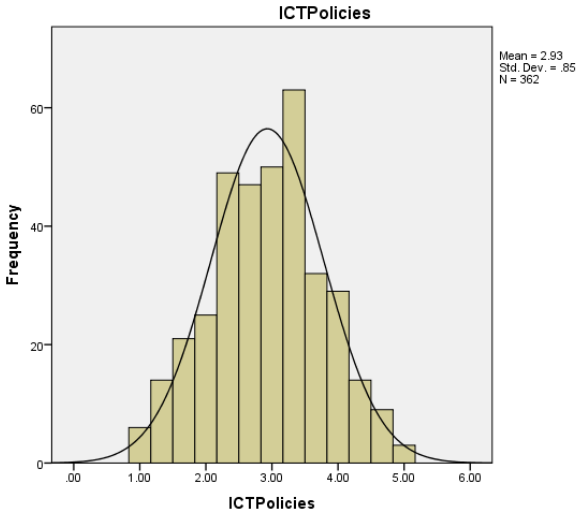
Appendix 5a: Histogram for Societal Structure



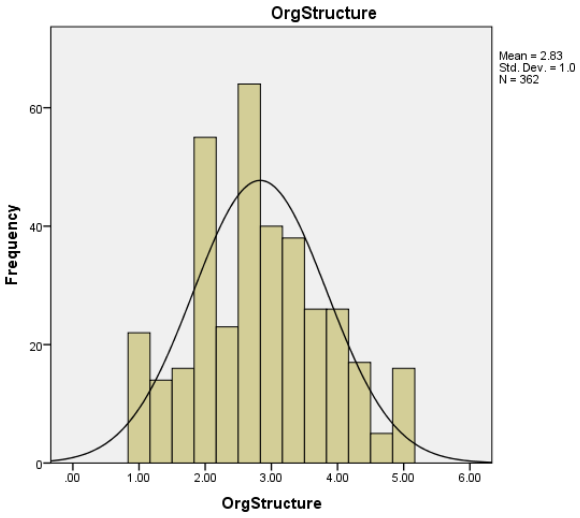
Appendix 5b: Histogram for ICT education



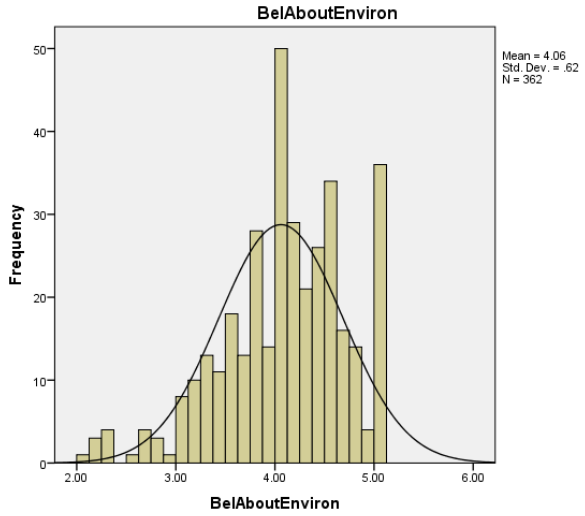
Appendix 5C: Histogram for ICT policies



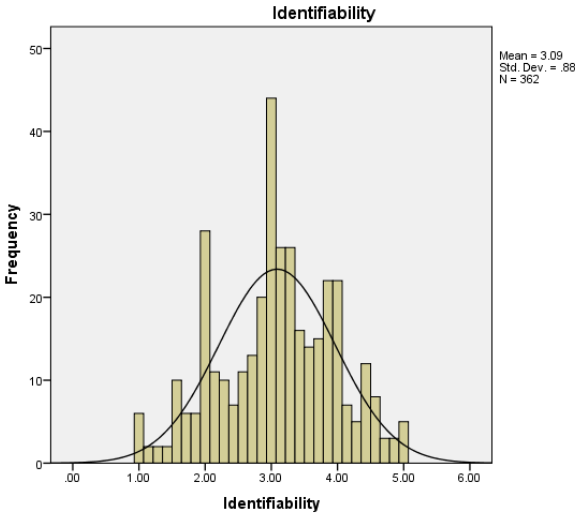
Appendix 5d: Histogram for Organisational Structure



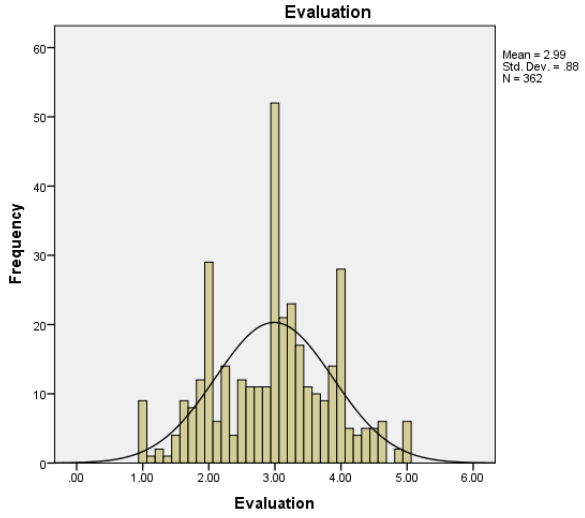
Appendix 5e: Histogram for Beliefs about the environment



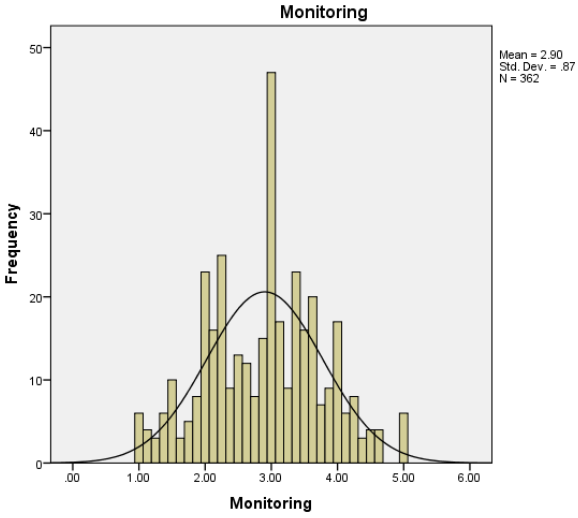
Appendix 5f: Histogram for Identifiability



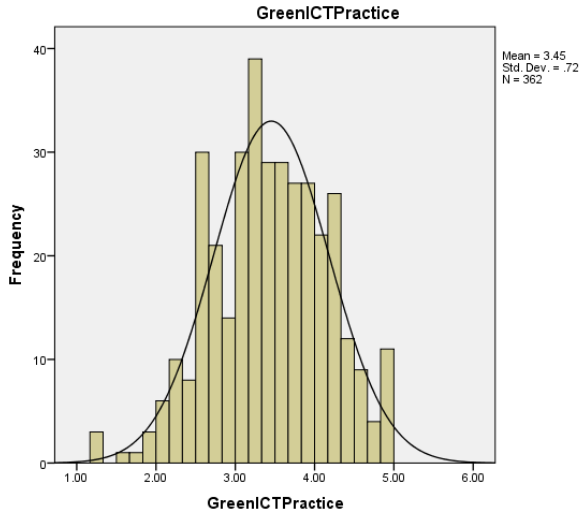
Appendix 5g: Histogram for Evaluation



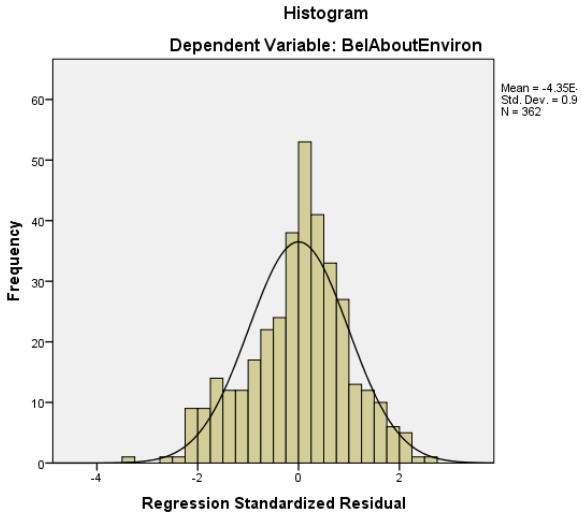
Appendix 5h: Histogram for Monitoring



Appendix 5i: Histogram for Green ICT practice

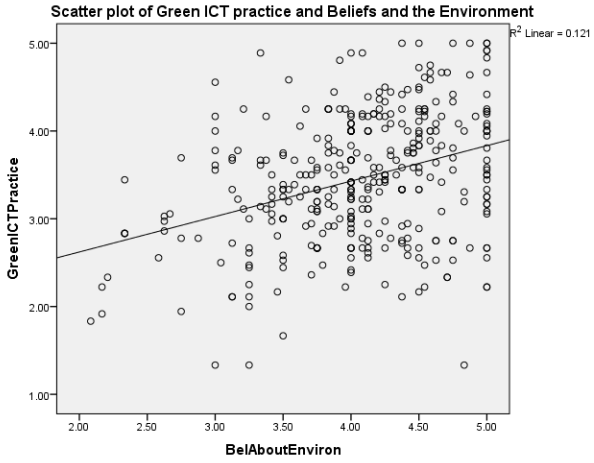


Appendix 5j: Histogram for the Moderation

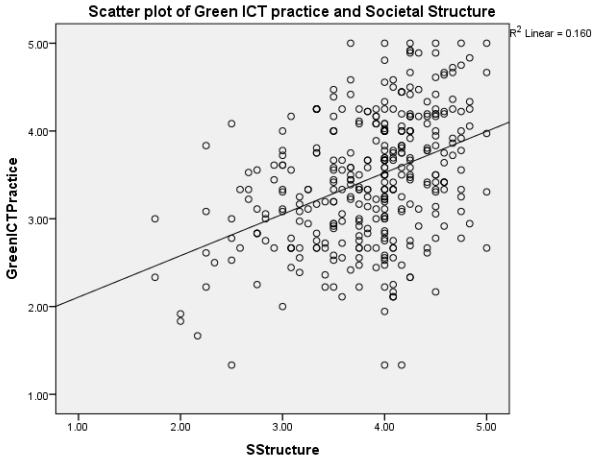


Appendix 6: Scatter plots

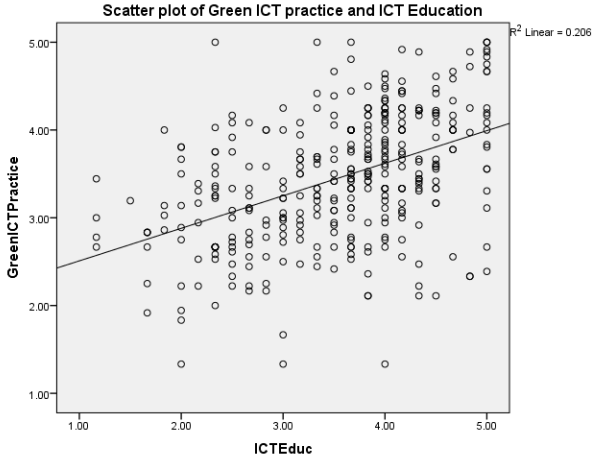
Appendix 6a: Scatter plot for Green ICT practice and Beliefs about the environment



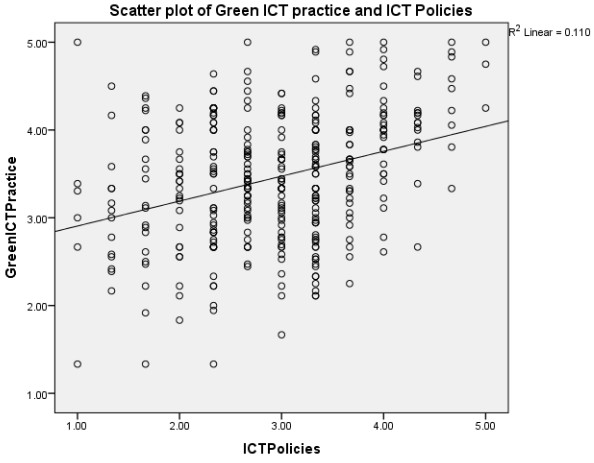
Appendix 6b: Scatterplot for Green ICT practice and Societal structure



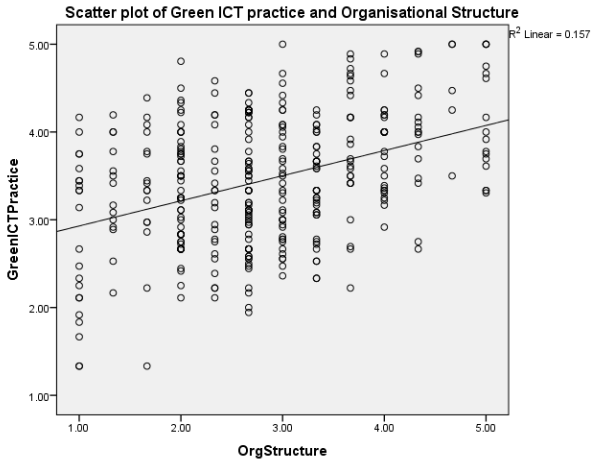
Appendix 6c: Scatterplot for Green ICT practice and ICT Education



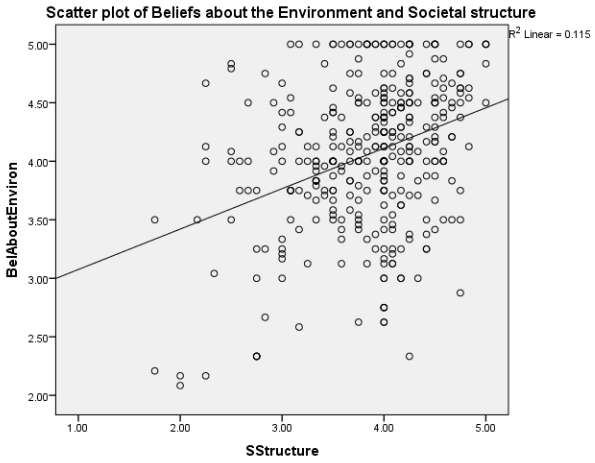
Appendix 6d: Scatterplot for Green ICT practice and ICT Policy



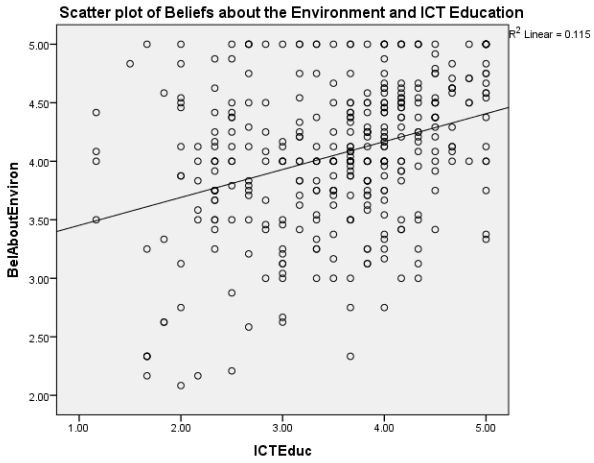
Appendix 6e: Scatterplot for Green ICT practice and Organisational structure



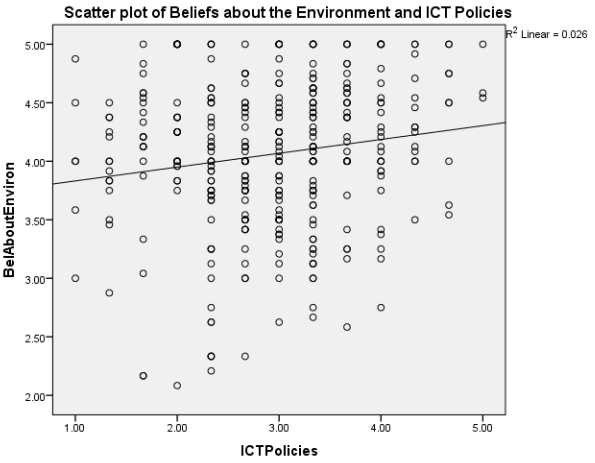
Appendix 6f: Scatterplot for Beliefs about the environment and Societal structure



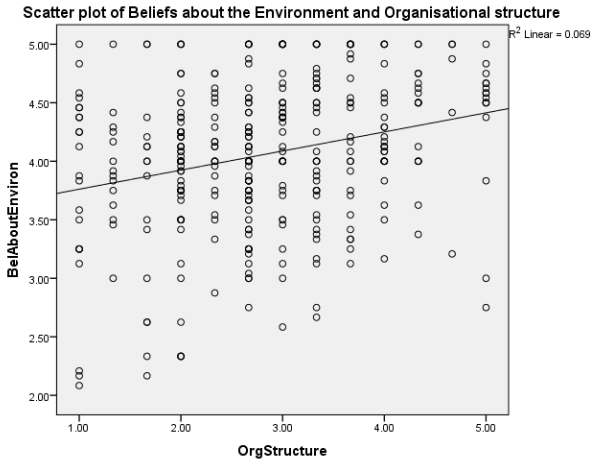
Appendix 6g: Scatterplot for Beliefs about the environment and ICT Education



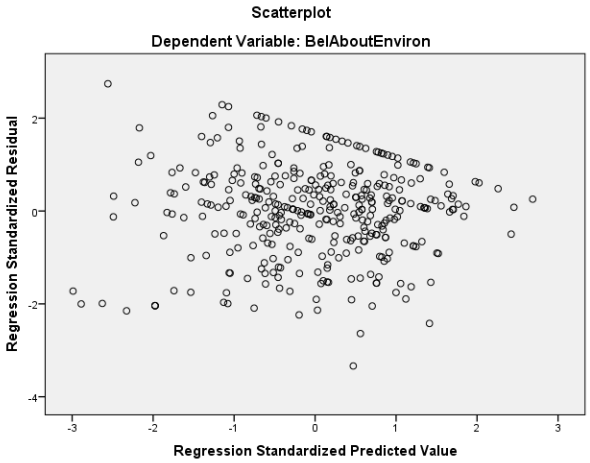
Appendix 6h: Scatterplot for Beliefs about the environment and ICT Policies



Appendix 6i: Scatterplot for Beliefs about the environment and Organisational structure



Appendix 6j: Scatterplot for Beliefs about the environment



Appendix 7: Correlation Results

	SStructure	ICTEduc	ICTPolicies	OrgStructure	BelAboutEnviron	GreenICTPractice
SStructure	1					
ICTEduc	.428**	1				
ICTPolicies	.278**	.314**	1			
OrgStructure	.249**	.325**	.491**	1		
BelAboutEnviron	.340**	.340**	.160**	.262**	1	
GreenICTPractice	.400**	.454**	.332**	.396**	.347**	1

Appendix 8: Linear Regressions

Appendix 8a: Beliefs about the environment as Criterion Variable

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.426[a]	.181	.172	.57118

a. Predictors: (Constant), OrgStructure, SStructure, ICTEduc, ICTPolicies

Appendix 8b: Beliefs about the environment as Criterion Variable

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.753	4	6.438	19.734	.000[b]
	Residual	116.468	357	.326		
	Total	142.221	361			

a. Dependent Variable: BelAboutEnviron

b. Predictors: (Constant), OrgStructure, SStructure, ICTEduc, ICTPolicies

Appendix 8c: Beliefs about the environment as Criterion Variable

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.484	.200		12.415	.000
	SStructure	.228	.055	.224	4.165	.000
	ICTEduc	.144	.039	.205	3.718	.000
	ICTPolicies	-.034	.042	-.046	-.815	.416
	OrgStructure	.101	.035	.162	2.882	.004

a. Dependent Variable: BelAboutEnviron

Appendix 8d: Green ICT practice as Criterion Variable

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.578[a]	.335	.325	.59913

a. Predictors: (Constant), BelAboutEnviron, ICTPolicies, SStructure, ICTEduc, OrgStructure

Appendix 8e: Green ICT practice as Criterion Variable

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.270	5	12.854	35.810	.000[b]
	Residual	127.788	356	.359		
	Total	192.059	361			

a. Dependent Variable: GreenICTPractice

b. Predictors: (Constant), BelAboutEnviron, ICTPolicies, SStructure, ICTEduc, OrgStructure

Appendix 8f: Green ICT practice as Criterion Variable

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	.672	.251		2.675	.008		
	SStructure	.208	.059	.176	3.533	.000	.754	1.326
	ICTEduc	.196	.041	.240	4.726	.000	.725	1.379
	ICTPolicies	.077	.044	.090	1.772	.077	.720	1.389
	OrgStructure	.139	.037	.193	3.750	.000	.708	1.413
	BelAboutEnviron	.164	.056	.141	2.955	.003	.819	1.221

a. Dependent Variable: GreenICTPractice

Appendix 9: Multicollinearity results

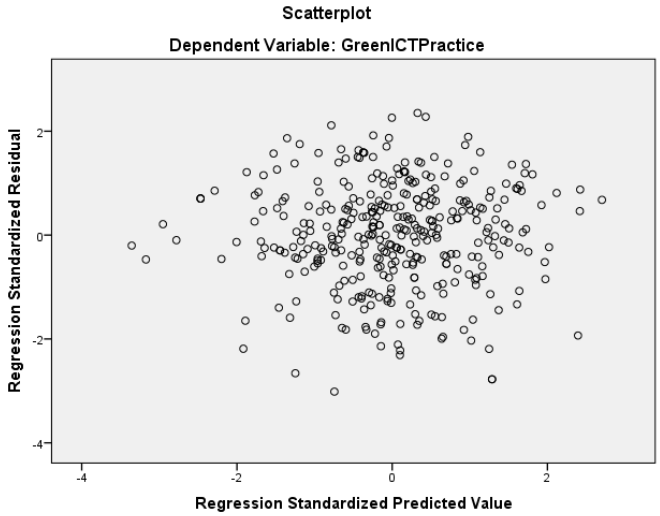
Collinearity Diagnostics[a]

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions					
				(Constant)	SStructure	ICTEduc	ICTPolicies	OrgStructure	BelAboutEnviron
1	1	5.809	1.000	.00	.00	.00	.00	.00	.00
	2	.084	8.329	.02	.02	.02	.07	.58	.02
	3	.046	11.270	.00	.00	.03	.89	.38	.01
	4	.036	12.693	.06	.01	.89	.00	.02	.05
	5	.015	19.388	.00	.73	.02	.02	.01	.48
	6	.010	23.643	.93	.24	.04	.02	.01	.44

a. Dependent Variable: GreenICTPractice

Appendix 10: Homogeneity of Variance

Appendix 10a: Scatterplot



Appendix 10b: Tests of Homogeneity of variance

Test of Homogeneity of Variance

		Levene Statistic	df1	df2	Sig.
SStructure	Based on Mean	5.761	1	360	.017
	Based on Median	5.852	1	360	.016
	Based on Median and with adjusted df	5.852	1	357.243	.016
	Based on trimmed mean	5.878	1	360	.016
ICTEduc	Based on Mean	2.128	1	360	.146
	Based on Median	1.636	1	360	.202
	Based on Median and with adjusted df	1.636	1	355.234	.202
	Based on trimmed mean	2.087	1	360	.149
ICTPolicies	Based on Mean	.288	1	360	.592
	Based on Median	.308	1	360	.579
	Based on Median and with adjusted df	.308	1	359.920	.579
	Based on trimmed mean	.267	1	360	.605
OrgStructure	Based on Mean	.615	1	360	.433
	Based on Median	.856	1	360	.356
	Based on Median and with adjusted df	.856	1	357.013	.356
	Based on trimmed mean	.651	1	360	.420
BelAboutEnviron	Based on Mean	.018	1	360	.893
	Based on Median	.038	1	360	.847
	Based on Median and with adjusted df	.038	1	355.937	.847
	Based on trimmed mean	.028	1	360	.867
Identifiability	Based on Mean	.274	1	360	.601
	Based on Median	.239	1	360	.625

	Based on Median and with adjusted df	.239	1	358.303	.625
	Based on trimmed mean	.270	1	360	.604
	Based on Mean	.159	1	360	.691
	Based on Median	.226	1	360	.635
Evaluation	Based on Median and with adjusted df	.226	1	359.861	.635
	Based on trimmed mean	.159	1	360	.691
	Based on Mean	.002	1	360	.967
	Based on Median	.003	1	360	.955
Monitoring	Based on Median and with adjusted df	.003	1	356.277	.955
	Based on trimmed mean	.002	1	360	.966
	Based on Mean	1.040	1	360	.308
	Based on Median	1.004	1	360	.317
GreenICTPractice	Based on Median and with adjusted df	1.004	1	359.921	.317
	Based on trimmed mean	1.036	1	360	.310